Development of a tool to define the population of emergency medical care users in South Africa

James Marcus Bowen

(Student number **20301114**)

A dissertation submitted in fulfilment of the requirements for the degree of Master in Technology: Emergency Medical Care in the Department of Emergency Medical Care and Rescue, Durban University of Technology

_____

Supervisor: L.D. Grainger (PhD)

April 2008

Declaration

The author hereby declares that the content of this research project is the author's own unaided original work, except where specific indication is given to the contrary (by reference). This work has not been previously submitted to the Durban University of Technology or any other University.

Signature: ---------- 

Date: ---------2 June 2008----------

Dedication

This work is dedicated to my wife Elaine for believing in me, my daughters Chanel and Paige for keeping me grounded and to my youngest daughter Gemma who was born when I began writing up this work and is now ten months old.

Acknowledgements

I would like to thank the following people for their assistance in helping me complete this research project and dissertation:

- Linda Grainger (PhD) for her supervision of this project and mentoring of me;
- Raveen Naidoo for his support as both boss and friend;
- Robert Owen for his guiding on some of the early technical aspects and providing constructive criticism;
- Sageshin Naguran for printing this document; and
- Bernard Pillay for acting as a research assistant in the very beginning while I was a green researcher.

I would also like to thank the following groups for their support: without them this research could not have happened.

- The participants of the focus group discussion
- The participants of the Delphi study
- The staff and students of the Department of Emergency Medical Care, Durban University of Technology who participated in this research
- The managers and paramedics of KwaZulu-Natal Emergency Medical Rescue Services who participated in this research

Abstract

Prehospital emergency medical service (EMS) data is essential for understanding the functioning of the services as well as the community's health. Being able to clearly and accurately define the patient population in terms of demographics and clinical condition may guide the EMS in resource management, clinical governance, research, education and political decisions. However, such data is limited in South Africa. This research, therefore, aimed to develop a data collection tool to determine the population of prehospital emergency medical care patients in South Africa. The objectives were: (i) determination of what data needed to be collected, (ii) development of a tool to collect the data, and (iii) testing the tool for ease and appropriateness of use and completeness of data collection in an authentic environment.

A mixed-method, predominantly qualitative methodological design was used, with some elements of grounded theory. There were three phases corresponding to the objectives. The first two were qualitative and the third was both qualitative and quantitative.

In the first phase expert consensus was sought, using a focus group discussion and Delphi study, to develop a minimum data set (MDS) to describe the patient population. The resultant MDS consisted of 18 data elements which could be categorised into demographics, time and location of EMS use, the clinical reasons for EMS use, and the actual use of the EMS. A tool and associated user instructions, based on the findings of Phase One, were developed and refined during Phase Two. Phase Three was used for testing the tool in an authentic environment. The tool was found to be acceptable and user-friendly. Further testing of the tool for accuracy and reliability is recommended.

Table of Contents

List of Tables

List of Figures

List of Excerpts

List of Charts

CHAPTER ONE: Introduction

"Data from a single …emergency medical service…system have not been fully used to describe health-related conditions for a defined community. Ambulance service data provide a community-wide representation that data from a single hospital cannot yield." (Brokaw, Olson, Fullerton, Tandberg and Sklar, 1998: 141). *"Ambulance data can provide information that is not available from routine ED* [emergency department] *electronic data, such as that relating to severity and initial conscious level. Ambulance data is also more likely to have more accurate information on the location of the incident"* (Downing, Wilson and Cooke, 2005: 739). These two very significant statements are the basis for this research: emergency medical service (EMS) data has not been used to its full potential and is essential for understanding community health.

1.1. Background to this research

South Africa has a population of about 47.9 million and a land area of 1,220,813 square kilometres, divided into 9 provinces (similar to states (USA) or counties (UK)) (StatsSA, 2007). The country is considered a developing economy and has a gross domestic product per capita of 2,500 U.S. dollars (about 19,000 South African Rand) (UN, 2003). The Medical Research Council's report on the leading causes of death in South Africa (Bradshaw, Groenewald, Laubscher, Nannan, Nojilana, Norman, Pieterse and Schneider, 2003) lists the top 20 leading causes of death; unsurprisingly the number one cause is HIV / AIDS. Of the remaining 19 causes of death 7 are within the direct influence of the EMS (ischemic heart disease, homicide / violence, stroke, road traffic accident, asthma and suicide), and 3 (diabetes, hypertensive heart disease and COPD) require EMS becoming involved during acute exacerbations. Thus the importance of EMS in the health services is confirmed.

The South African health services are divided into the public and private sectors; both of which offer the full spectrum of health services, including EMS. The public sector operates on the district health system with three tiers of governance and management – national, provincial and district (Pillay, McCoy and Asia, 2001). The national Department of Health has an oversight role of the provision of EMS; each

province is then responsible for its own delivery. The delivery of public EMS varies across the country – in some cases it operates as a direct provincial service or EMS provision may be devolved to district level or outsourced to local authority fire and emergency services (Macfarlane, Loggerenberg and Kloeck, 2005). The private sector EMS is comprised of two national organisations affiliated with private health care groups and many smaller, independent ambulance services. Aeromedical services are provided by private sector EMS and non-profit organisations, both independently and in partnerships with the public sector.

The education and training of EMS personnel is overseen by the Health Professions Council of South Africa (HPCSA) and conducted by public higher education institutions and private and public ambulance training colleges. The training ranges from a four week course to a four year university degree; all practitioners are required to register with the Professional Board for Emergency Care Practitioners (PBECP) within the HPCSA (HPCSA, undated).

It is essential that uniform data is collected so that access for all South Africans is achieved, good governance is maintained and quality can be improved on.

1.2. The research problem

There is no comprehensive and integrated data collection in the South African prehospital EMS; in particular, very little data is currently collected on patient populations using this service. Where it is undertaken, it is either focused on sub-groups of patients (Doull, 2005) (e.g. those undergoing aeromedical transportation) or based on dispatch information (Lottering, 2005) (limited information given by a non-medically trained requester for EMS).

The existing data collection forms, known as patient report forms (PRFs), used by the public and major private services do not capture a common set of data. Therefore, we cannot use them to determine the population of patients managed in all EMS. Furthermore, they do not lend themselves to easy electronic data capturing, which presents another challenge to developing a national database.

This research aims to develop a tool that could be used by all EMS to collect a minimum standardised set of data. Key aspects to such a project are determining what data should be collected and developing the tool to collect it. A tool must be subjected to a variety of evaluations to ascertain whether it is able to collect the desired data. These include checks for ease and appropriateness of use through to validity and reliability testing. This project will involve only the initial stages of testing.

That data collected with the tool could later be used to establish a database, which would enable the EMS profession to evaluate many aspects relating to the performance of the EMS.

A more detailed explanation of the key points identified in this research problem is contained in section 2.6.

1.3. The purpose of the study

Develop a data collection tool that can be used to determine the population of prehospital emergency medical care patients in South Africa.

1.4. Objectives of the study

The first objective was to determine what data needed to be collected to describe the patient population using the EMS.

The second objective was to develop a tool, and associated user instructions, based on the findings of the first objective.

The third objective was to test the tool for ease and appropriateness of use and completeness of data collection in an authentic environment.

1.5. Motivation for the study

The initial motivation for the study was developed during the researcher's attempt to identify a research question for this Masters degree. The researcher was one of the first six students registered for the Masters degree in Emergency Medical Care; the first qualification of its kind in South Africa. This initial registration marked a new

beginning for research in the field of prehospital emergency medical care in South Africa. Cognisant of the lack of literature on the population utilising EMS, the researcher decided to start at what he believed to be the root of health research – who are the patients?

During informal conversation between the researcher and key stakeholders (i.e. board members of the PBECP and managers in both private and provincial EMS) all expressed an interest in this study and affirmed the need for it. Therefore, the researcher decided to develop a tool to capture the data necessary for characterising the EMS population. Thereafter, the intention is to test and further refine it if indicated, and then work with the profession to implement it nationally.

In essence, a detailed knowledge of the patient population should assist in answering questions on many aspects of the EMS; examples follow.

i. Management: are resources being utilised appropriately and efficiently?
ii. Clinical Governance: what is the relationship between dispatch (emergency telephone control centre) and on scene diagnoses?
iii. Research: what are relevant areas in which to do prehospital emergency care research?
iv. Education: what trauma and medical conditions should receive more emphasis in order to have greater relevance to the patient population?
v. Politically: does the community have equality in EMS and are issues of the past being redressed?

This need for information is discussed in depth in section 2.1.

1.6. Assumptions of the study

The researcher assumes that knowing who is using the EMS is essential in evaluating the service, addressing the needs of the users and improving quality of the health care provided.

1.7. Delimitations of the study

The focus of the study was the development of the data collection tool. In testing it, the researcher was concerned about the completeness of the data that was gathered during its use. No attempt was made to check the accuracy of the data collected (This may be an area of future study). Therefore, it was assumed that the participant emergency care practitioners completed the patient report forms (PRFs) as honestly as possible, and that what was indicated on the form was correct according to the practitioners' knowledge.

1.8. Changes to the proposed study

When this research proposal was initially conceptualised the purpose of the study was larger. It included the development of a data collection tool that, not only could be used to determine the population of prehospital emergency medical care patients in South Africa, but also meet the clinical, legal, financial and administrative requirements of the emergency medical services. However, during the first stage of the project the research question was further clarified as commonly occurs in qualitative research (Polit and Beck, 2006) and it became clear that the tool should only contain the minimum data set necessary to characterise the population. The rationale behind reducing the focus of this study is found in section 4.2.1.2.

Furthermore, initially the third objective was to test the tool by assessing the participants' opinions of the form and the completeness of data collected on the forms, as well as comparing the manual versus automatic data entry (ADE) of the forms. The latter aspect was a small component of the testing. The researcher was offered the free use of the appropriate software for this data capture by a computer software developer. However, at the time that the researcher was ready to test electronic capture the software was no longer available. Thus it was decided to remove this section of the study. The researcher and supervisor are satisfied that the removal of this component has not compromised the study as its focus was on developing the tool. The ADE aspect resulted from a perceived opportunity to take the project a step further towards implementation of a database. It not related to the MDS and basic form design. However, ADE will certainly be an area for future study (section 6.3).

1.9. Definition of terms

Definitions for terms are shown in Table 1.1. These include terms which may be either unfamiliar to a reader not acquainted with the prehospital emergency medical services (EMS) or terms for which there are multiple meanings. In the latter case, the meaning for the purposes of this research project is indicated. The definitions have been derived from references (some of which are discussed in Chapter Two) and from the researcher's experience in the EMS industry.

Table 1.1: Definition of terms

Term	Definition
Data element	*"The smallest unit of information that has meaning and can be managed electronically"* (Kleinbeck, 1996: 926).
Data set	A group of data elements that are used for a common purpose or to answer a specific question.
Delphi study / technique / method / approach	These are synonymous terms all used for the purposes of this research to describe an iterative method of generating ideas and facilitating consensus among individuals (who have special knowledge to share), via email or post.
Definitive management	The treatment that a patient requires not just to maintain life but to reverse or repair the condition; e.g. morphine is not definitive management for acute myocardial infarction as it relieves the chest pain but does not unblock the coronary artery, in this case thrombolysis is definitive management as it unblocks the artery thus reversing the ischemia.
Emergency medical service (EMS)	Prehospital EMS or prehospital ambulance services
Emergency care practitioner – advanced (ECP-A)	A health care professional that has completed the Critical Care Assistant course or the National Diploma in Emergency Medical Care.
EMS condition	Defining what is wrong with the patient based on their clinical features; it may be a specific diagnosis (e.g. myocardial infarction) or a vague indication of a problem (e.g. acute abdomen)
Focus group discussion	A group discussion led by a facilitator and made up of experts in a particular industry to discuss a particular topic
Minimum data set	The minimum data elements that are required to develop the data necessary to answer a specific question
Patient report form (PRF)	Documentation completed for every patient transported by EMS. Usually contains data on: patient's clinical condition, billing information and administrative details (e.g. times, mileage).

1.10. Overview of the dissertation

Chapter One introduces and provides a background to the study; it also includes the purpose, motivation, objectives and assumptions of the study, and definitions of terms. A literature study providing the framework for the research is presented in Chapter Two. Chapter Three details the methodology used to meet the objectives.

The project was divided into three phases, with each phase corresponding to an objective. Phases One and Two were purely qualitative research; Phase Three followed a mixed method format, using both qualitative and quantitative research methods. As this is a methodological study the methodology chapter (Chapter Three) is very detailed and in a sense part of the results. The findings and discussion for each phase are presented together to avoid repetition and ease of reading. Chapter Four presents the findings of Phases One and Two, which are concerned with the development of the MDS and data collection tool. The findings for Phase Three are presented in Chapter Five. A conclusion, critical review and recommendations are presented in Chapter Six.

CHAPTER TWO: Literature review

This chapter presents the literature that has served as a background to the study and a justification for such a study. Recent literature is used to show that there is a need for a comprehensive EMS health information system, and specifically for information to define the patient population, and that this need is not being met adequately, both internationally and in South Africa. There is discussion on the systems in place for collecting EMS data and their shortfalls in adequately defining the patient population; again presented in both international and in South African contexts. This study ends with some discussion of the literature regarding tool development, both from minimum data set (MDS) and technical requirement perspectives. More literature will be presented and discussed in the chapters on the methodology and findings, where it will be more relevant and specific.

Literature for this dissertation was sourced using the PubMed (http://www.ncbi.nlm.nih.gov/sites/entrez/), Proquest (http://www.proquest.com/) and Science Direct (http://www.sciencedirect.com) databases with the following search terms, in various combinations: ambulance, database, data collection, data set, demography, emergency medical services, health informatics, information systems, medical informatics, minimum data set, patient report form, patients, population, population groups and research. Additional literature was gained from experts in the field and a follow up of references in all located literature. The Google search engine (http://www.google.co.za) was used to search with the above terms, both specified to South African websites and over the entire web. Experts in the fields of form design, data collection and capture, and the EMS were consulted via personal communication (face-to-face and email).

Literature (and personal communication data) was chosen based on the relevance of such information to this study.

2.1 The need for and availability of prehospital emergency medical care data

Good overall health and equality in distribution of levels of health are the main goals of a health system (WHO, 2000). Supporting goals are to be responsive to consumer demands and ensure fair financing of the health system. To meet these goals the

functions of stewardship (or governance), financing, creating resources and delivering services must be performed. In order to fulfil all these functions, more detailed and relevant information is required.

EMS are an important part of the health system. The manner in which they are provided contributes to the achievement of the goals of the health system. Similarly their contribution is influenced by the way in which the abovementioned functions are carried out. Therefore, good information pertaining to EMS is essential (Hsiao and Hedges, 1993; Brokaw, Olson, Fullerton, Tandberg and Sklar, 1998). It has been suggested that one of the roles of EMS is the collection of data because of its additional advantages to other sectors of the health system. The reasons for this are that (Razzak, Luby, Laflamme and Chotani, 2004; Downing et al., 2005):

i. it is easy to collect;
ii. it is low cost;
iii. the on-scene information is more reliable than that found in hospital data (in terms of location and initial presentation), and
iv. it may identify the more severe injuries and illness

In 1989, Lang (as quoted by Kleinbeck, 1996: 927) put the importance of good quality data in perspective: *"If we cannot name it, we cannot control it, finance it, teach it, research it or put it in to public policy."*

Spaite et al. (1995), in reporting on the Uniform Prehospital Emergency Medical Services Data Conference, state that modern EMS systems have encouraged the public's expectation of immediate and continuous availability of emergency care outside the confines of traditional health care facilities. However, the scientific evidence of the effectiveness of this care is not conclusive. At the centre of this is the fact that no broad-based, reliable, accurate collection of EMS data occurs. Mears et al. (2002) concur that data at all levels typically are inadequate to describe EMS as a profession. In a summary report of Data Elements for Emergency Department Systems (DEEDS), Pollock et al. (1998) mention that clinical data storage is primarily for patient management; however it can be reused to assist with continuity of care and facilitate clinical, population and other health research. A lack of uniform data

elements, both within and across systems, has unfortunately prevented both these primary and secondary data functions.

In their review of the history of EMS information systems and discussion on the way forward Mears, et al. (2002: 123) list five reasons for implementing national EMS databases:

i. *"Developing nationwide EMS training curricula;*
ii. *Evaluating patient and EMS system outcomes;*
iii. *Facilitating research efforts;*
iv. *Determining fee schedules and reimbursement rates; and*
v. *Providing valuable information on other issues related to EMS care."*

The committee on EMS for children (EMS-C) has had a significant impact on what data is, or should be collected by EMS systems (NEMSIS, 2005). In fact the National EMS Information Systems (NEMSIS) project (discussed briefly in section 2.2) used the following quote as a guiding principle: *"Without a broad and reliable base of information, it is hard for anyone – emergency care providers, administrators, parents, policymakers – to determine in any systematic way how successful EMS-C systems are at providing appropriate timely care or what they ought to do to improve performance and patient outcomes."* Durch and Lohr, 1993: 224). This committee has stated that they would like information on the following aspects of the EMS system: who uses the system, for what and when. Further they require information on the system structure, services and procedures offered, with resultant outcomes and costs. The committee states that it, and all EMS providers, require this information for planning, evaluation and research for successful EMS provision (Durch and Lohr, 1993).

Thus it can be seen that data is required for:

i. clinical management and recording;
ii. activity, performance and quality measurement;
iii. resource management; and
iv. policy development.

From the above, it is evident that there is a significant need internationally to establish comprehensive and integrated EMS health information. Thus the needs of the international EMS community are similar to the South African needs motivating this research (sections 1.1. and 1.4).

2.2 Efforts to develop prehospital emergency medical services health information systems

As stated in the preceding section, countries do not appear to have implemented a single uniform prehospital EMS health information system. However, there have been projects to develop such systems. This section describes these efforts.

The primary function of a clinical record system is for the management of patients and as such must fit easily into the work flow of busy health care providers (Pollock et al., 1998). This point was echoed by the Uniform Prehospital Data Conference (Spaite et al., 1995). While different personnel who take part at different stages of emergency care have different requirements for data collection, there are similarities that allow the development of a single model focusing on a few of the most important parameters. It is however important to develop standardised vocabularies and taxonomies (Spaite et al., 1995; Toth, 2003). The projects described hereafter have sought to do just this, as discussed in Chapter Three's (section 3.1) discussion on grounded theory.

The United States Department of Transport (the government agency responsible for EMS) issued a report in 1996 which included five recommendations for EMS information systems (IS).

i. Uniform data elements must be adopted.
ii. Data must be valuable, reliable and accurate.
iii. The data should assist in determining patient outcomes and cost effectiveness.
iv. EMS IS should integrate with other relevant IS.
v. The users of the data should provide feedback to the data generators / collectors in the form of research results, quality improvement and evaluation (Mears et al., 2002).

In 1995, Spaite et al. reported on the Uniform Prehospital Data Conference and a three-year process to develop a broad-based, well-conceived, accurate and reliable, uniform EMS dataset. The purpose of this dataset, though not clearly stated, appears to be collect data to answer questions on outcome, impact, and cost-effectiveness of the prehospital EMS. In the opinion of the researcher, the resultant dataset does not do this adequately: of the 81 data elements, 49 are considered essential. In these essential elements there is no consideration of interventions or change in vital signs (thus impact cannot be measured) and more than 30% of the elements are administrative data (address, incident numbers, patient name, siren use). Thus the researcher feels that this dataset as a whole is unsuitable for its purpose and neither would it meet the needs of the South African EMS, which motivated this study. This opinion is echoed by Mears et al. (2002) who, though they cite this conference as a valuable effort, maintain that there is no adequate uniform data linkage to effectively evaluate the EMS. However, there are elements of the dataset that have informed this study.

Other data collection systems include the Utstein-style of reporting out-of-hospital cardiac arrest (Cummins, 1993) and major trauma (Dick and Baskett, 1999), trauma and cardiac arrest registries (Hunt, Baker, Fakhry, Rutledge, Ransohoff and Meyer, 1999; Adams and Whitlock, 2004), and motor vehicle accident and cause of death databases (Mears et al., 2002). The problem with these data collection methods and databases is that although they are able to compile detailed data on all phases of patient care, they do so only on a limited portion of the patient population cared for by the EMS (Durch and Lohr, 1993).

Because of the lack of standardised, integrated EMS data the National EMS Information System (NEMSIS) was developed by various role players in the United States' EMS industry; including the NHTSA (the US's National Highway Traffic Safety Association). This system expanded on the Uniform Prehospital Dataset, initially developed in 1994 (Spaite et al., 1995) and subsequently revised in 1998. NEMSIS now provides technical assistance for the implementation of the dataset and a dictionary of over 400 data elements. These elements are grouped into two sections: a demographic dataset and an EMS dataset. The demographic dataset

describes the EMS system, while the EMS dataset describes the EMS event. Both datasets have subsections to further classify the data elements; however there is no guide as to which data elements should be grouped together in order to identify certain information. For example, the subsection “Patient” has 19 data elements, only 7 describe demographic details (such as gender, race and age) while the remaining elements consider identification data and contact details (NEMSIS, 2005; NHTSA, 2006). The researcher’s concern is that if a service were to describe its patient population, this section would clearly be inadequate and data from other subsections would be required. Since no consensus has been indicated on which data elements to use to develop this information, it can be assumed that different EMS providers would describe their populations by means of different data elements, thus preventing accurate comparisons. The same would hold true for other information needs. Therefore one questions whether the purposes of EMS data to identify outcomes and guide education, research and reimbursement rates (NEMSIS, 2000) can be met without further consensus being developed on groupings of data elements to describe specific EMS issues. While the NEMSIS project (NEMSIS, 2000) claims to have support from most of the United States it is not extensively referenced as a data source. The researcher conducted a PubMed search (http://www.ncbi.nlm.nih.gov/sites/entrez/) using the keyword “NEMSIS” and came up with only one journal article. In a search for NHTSA 145 references were found, only one had any mention of NEMSIS in the abstract, title or keyword; this was the same article as found when searching “NEMSIS”. The researcher has had similar results on Google (http://www.google.com) searches and thus feels confident that this research project is not developing a dataset when a suitable one already exists.

There has been considerable work done in the development of a MDS for time points and intervals related to rotor-wing aeromedical transport by Thompson and Schaffer (2002). The literature describes use of the Delphi method to develop the MDS. Greater discussion of this literature occurs in the specific methodology sections (Chapter Three).

2.3 Characterising the population using the prehospital emergency medical services

As discussed in section 2.1: The World Health Organization (WHO) describes the main goals of a health system as good overall health and equality in distribution of levels of health; and emphasises that detailed, relevant information is required to meet these goals. The information needs include epidemiological aspects, utilisation patterns, health-seeking behaviour of target groups and an understanding of patient needs (WHO, 2000). One particularly important type of information that is required is patient utilisation data. Monitoring and analysing EMS utilisation data can assist in defining and evaluating health care usage and conditions for particular communities thus giving guidance to the health care system and encouraging the development of ideas in the improvement of cost-effective community health (Hsiao and Hedges, 1993; Wofford, Moran, Heuser, Schwartz, Velez and Mittelmark, 1995; Brokaw et al., 1998). Thus it is imperative that the population using EMS is known for the proper functioning of the health system.

2.4. Defining appropriate use of the prehospital emergency medical services

An increasingly evident problem discussed in literature is the increased demand for ambulance services, much of which is attributed to an increase in inappropriate EMS calls. Some studies have shown that 40 – 50% of total ambulance responses in the US, UK, Canada and Sweden are for inappropriate calls (Brady, Hennes, Wolf, Hall and Davis, 1996; Brokaw et al., 1998; Kawakami, Ohshige, Kubota and Tochikubo, 2007). The researcher and colleagues, through their experience in EMS, have personally noted what could be considered inappropriate ambulance calls. This view is shared by Kawakami, et al. (2007) who states that the problem of inappropriate ambulance callouts is increasing throughout the world. The literature on the apparent misuse of the EMS highlights a number of possible causes, including elderly patients, paediatric patients and socio-economic factors (Gardner, 1990; Stathers, Delpech and Raftos, 1992; Brown and Sindelar, 1993; Billittier, Moscati, Janicke, Lerner, Seymour and Olsson, 1996; Camasso-Richardson, Wilde and Petrack, 1997; Palazzo, Warner, Harron and Sadana, 1998; Richards and Ferrall, 1999).

The problem of inappropriate use is directly related to the lack of a definition of an appropriate emergency response (Thomson, 2005). However, determining what is appropriate is influenced by the multiplicity of possible responses, cost and availability of resources and differing perceptions of need on the part of service providers and consumers (WHO, 2000). Furthermore, conditions in countries differ. The type, severity and distance of responses differ vastly between the developed and developing worlds (Thomson, 2005). Hauswald and Yeoh (1997) echo this view in their discussion on designing EMS systems for developing nations. In this paper they present problems facing efficient EMS operations which are not commonly found in Europe, North America and Britain. The concerns raised by both papers are very similar to those affecting South African EMS, especially in the rural and previously disadvantaged township areas. An analysis of the Cochrane Injuries Group's review of published work on trauma supports this, finding that a global view of trauma and trauma care cannot be taken. Due to the effects of social, economic and environmental factors both the type of injuries and the most appropriate response to these injuries would vary widely between developed and developing nations (Coats and Goode, 2001). In addition, some EMS systems may provide non-emergency services, such as transport for the chronically ill and home based care. (Brady et al., 1996; Brokaw et al., 1998; Thomson, 2005). While a few EMS systems do not dispatch emergency care practitioners (ECPs) to requests it deems inappropriate, the majority of international EMS agencies respond to all calls with an “appropriate level of care for the clinical condition of the patient” (Marsden, 1995; Adnet and Lapostolle, 2004; Gomes, Araujo, Soares-Oliveira and Pereira, 2004). According to the Director of the National Emergency Medical Services no definition for appropriate EMS use has been made for South Africa (Fuhri, 2005); however a 1994 study by Owen and Dimopoulos indicated that inappropriate levels of emergency care provider responses were common in parts of the country.

It is clear from the above that there is a need to determine what an appropriate EMS response is in order to make best use of the available resources. However, this cannot be done without characterising the population utilising the EMS in South Africa, thereby providing further motivation for this research.

2.5. Recent literature on populations utilising the prehospital emergency medical services

This section of the literature review deals with the collection of this specific and fundamental set of EMS health information – namely data to characterise the population using EMS, which is the focus of this study.

Detailed international studies defining the patient population in emergency medicine are frequently limited to emergency department patients. A 2007 study by Nawar et al. is typical of this; the patient population is described in terms of demographics, reasons for requiring emergency care and the severity of their conditions. Of the studies found, four typical studies from the United States (Phelps, Rodriguez, Passanante, Dresden and Kriza, 2002), the United Kingdom (Melton, Jain, Kendrick and Deo, 2007), Norway (Langhelle and Mellesmo, 2000) and Pakistan (Razzak et al., 2004) demonstrate that whilst these studies are useful for collecting data to answer specific questions, they have not been designed to define the general patient population. The Norwegian study described the trauma population using a rural ambulance helicopter (Langhelle and Mellesmo, 2000). The study in Pakistan, aimed to identify the epidemiology of injured children (Razzak et al., 2004). Both these studies consider demographic details (gender, age) and the reason for calling (mechanism of injury, circumstances, type of injury). While the Norwegian study also looks at severity of injury, the Pakistani study considers only two levels of severity – dead or alive on arrival at hospital (Langhelle and Mellesmo, 2000; Razzak et al., 2004). These studies were only concerned with incidences of trauma and not medically related emergencies with the exception of the American study, which focused on a low socio-economic urban area and the populations' use of the EMS or non-stroke, non-myocardial infarction, critically ill patients (Phelps et al., 2002). Of the four studies discussed here, only the British study is directed at a wide variety of patients; however this study was conducted on the helicopter EMS, thus again being only for a specific subset of patients (Melton et al., 2007).

A retrospective study was conducted by Weiss et al. (2000) to determine gender differences in EMS transport for illnesses and injuries, and differences in management for four specific conditions: cardiac arrest, chest pain, allergic reactions

and extremity fracture. This study evaluated the patient population by extracting data on aetiology, demographics (race, age, gender) and clinical condition (systolic blood pressure, pulse rate, injury/illness) from a state database. The authors state that diagnostic inaccuracies could have occurred due to limitations of the data collection tool: (i) certain diagnoses were inconsistent with their headings (e.g. seizures and asthma were 'considered injuries'); and (ii) some diagnostic terms where considered vague, notably those of 'chest pain' and 'allergic reaction'. The authors further explain that they were limited by only choosing four diseases to investigate.

Describing the specific patient population is essential. A study was conducted on EMS utilisation for non-stroke, non-myocardial infarction, critically ill patients presenting at hospital emergency departments in a low socio-economic urban area in the United States. It found that own transport was a major reason for not using ambulance services (Phelps et al., 2002). This was similar to the situation in Malaysia, a developing country with a comparatively poorly developed EMS system. However, in Malaysia any transport (friends, taxis, police, tow-trucks, etc) was used over ambulances (Hauswald and Yeoh, 1997). Some of the reasons for this non-use of ambulances were similar – a potential delay in transportation and lack of knowledge of benefits of emergency medical care on scene and *en route* to hospital. In comparing the two services it is evident that the Malaysians may well be correct in both assumptions of their EMS, (slow and without great benefit) while the Americans are not (in accordance with accepted international guidelines). The American study further showed that patients were also concerned about the additional costs that could be incurred and that they underestimated the severity of the symptoms (Hauswald and Yeoh, 1997; Phelps et al., 2002). Thus is important, when trying to educate patients on the use of the EMS, to consider their specific circumstances; this in turn requires information about the specific patient population.

Canto et al. (2002) considered the patient population in their research on the use of the EMS for acute myocardial infarction. They were able to compare demographic data (age, race and gender), health care funding (managed care, state or commercial insurance) and severity by studying a national myocardial infarction registry. The researchers were also able to show that time to definitive management

was decreased when EMS was used, and are thus able to direct patient education to the population most requiring it.

Two studies on geriatric persons' use of the EMS (Wofford, Moran, Heuser, Schwartz, Velez and Mittelmark, 1995; Dickinson, Verdile, Kostyun and Salluzzo, 1996) and two on the whole population's use of ambulance transportation (Rucker, Edwards, Burstin, O'Neil and Brennan, 1997; Svenson, 2000) have revealed that elderly people are more likely to use the EMS than younger persons. These four studies, while beneficial in describing part of the population and thus informing policy have a number of limitations expressed. These limitations are based on the retrospective use of databases not developed with an aim of describing the patient population; thus specific questions cannot be answered due to the required data not been collected. Specific limitations were identified.

i. That age groupings were used as opposed to exact age or date of birth, thus a limitation to the maximum ages reported on (Wofford et al., 1995; Dickinson et al., 1996; Svenson, 2000). This is of concern when patient's ages are reported in five year bands up to 64 years of age and then all persons from 65 are considered together, despite marked differences in health status and service utilisation between the 'old' and the 'very old' (NCHS, Undated).
ii. That race was not included as a data element (Svenson, 2000).
iii. That not all patients were included as only a small number of chief complaints were looked at and only when a research assistant was available to conduct an interview (Rucker et al., 1997).
iv. That the accuracy of electronic data could not be confirmed (Wofford et al., 1995; Svenson, 2000).
v. The dataset was arbitrarily decided on (Rucker et al., 1997).

Only one item of published literature has been found regarding the population utilising EMS in South Africa. This study described the population only in terms of priority within an EMS system (Owen and Dimopoulos, 1994). Certain services do collect data by which the patient population can be described, however this is limited to either population specific data only for a very narrow patient type (Doull, 2005)

(e.g. those transported by aeromedical services) or is insufficient with which to define the population adequately (Gibbs, 2005).

It is clear that where good data exists regarding the patient population, improvements can be made in both the EMS system and in patient education. There is, however, a lack of reported databases that consider the EMS population as a whole and thus only limited conclusions can be reached on a narrow group of EMS patients. This further highlights the fragmented EMS system (section 1.1).

2.6. Prehospital EMS data collected in South Africa

In South Africa, one provincial EMS captures a range of data in their communications centre. The data related to the patient population is, however, quite small. It includes the following: suburb, dispatch and on-scene severity coding, diagnosis, whether the case was a patient entrapment and if cardio-pulmonary resuscitation was conducted. A conversation between a communications centre data capturer and the researcher (Lottering, 2005) revealed the following limitations to this dataset.

i. The crews are required to report their diagnosis and severity coding to the communications centre (a procedure seldom followed), failing which the dispatch severity and diagnosis are assumed to be correct. Thus the diagnosis and severity coding is that which has been obtained via a telephonic conversation and not that which was actually found on scene.
ii. No data is captured from the ambulance PRF. Again the data collected only reflects that which the dispatcher could obtain from the caller as opposed to the actual patient data obtained on scene; which may or may not be different.
iii. The database is built on an *Excel*® (Microsoft Corporation) spreadsheet and coded in such a manner that it is extremely time-consuming to determine how many incidents of a specific diagnosis occur or how often advanced life support emergency care providers respond to calls.

This is typical of other South African EMS systems in which the researcher has been employed, and was subsequently confirmed by the Delphi study (section 3.2.3)

panellists who brought collective experience from a variety of South African EMS systems.

Four PRFs typical of those currently in use in South Africa (Forms 1 to 4) are attached (Appendix A). The data collected on Forms 1 and 2 is not used for any analytical purpose; the forms are simply stored in archives. A limited amount of data for analysis is captured manually from Form 3 (Gibbs, 2005). Much of the data from Form 4 is re-entered into an internet-based form by the ECP student who managed the patient and completed the Form; only a small number of patients are seen.

The general problems with the forms are that there are duplicate data fields (Form 1), that irrelevant data is collected (Form 1), that all possible options cannot be collected (Forms 1 – 4), some data elements are not collected in a manner for easy capture (Forms 1 – 4), and that related data fields are scattered across the form (Form 1)

Forms 1 to 3 are single-sided A4-size, Forms 1 and 2 have separate A4 account pages; Form 4 is a double-sided A4-size with no billing section. This demonstrates the diversity in the volume of data on the PRF which is collected by different services.

2.7. Development of a tool to collect patient population data

This section describes the literature that has been identified concerning two key aspects relevant for developing a tool to collect data to define the population using EMS. Firstly determining what data is required and secondly designing the tool to enhance completeness of data collection and capture.

2.7.1 Determining the data to be collected

2.7.1.1. Determination of a minimum data set

Data sets are composed of a number of data elements; and a data element is *"the smallest unit of information that has meaning and can be managed electronically"* (Kleinbeck, 1996: 926). Kleinbeck further goes on to classify data elements into three categories.

i. Global: A common definition across many groups, e.g. time, age or date.
ii. Focal: Focused and clearly defined by a particular group, the data can be articulated to other individuals, e.g. wound classification by perioperative nurses.
iii. Numerical: Data elements too complex to be described in a few words and are thus given numerical codes, e.g. ICD-10 coding.

As alluded to in section 2.1.2, comprehensive national data rather than data from disparate groups are needed. Therefore, it is global data elements that are to be developed in this study. However it is not a question of *"how do we gather together all available data into automated data banks?"* (Murnagham; 1973 quoted by Toth; 2003) It is quite possible to collect large amounts of data, but accuracy and completeness are indirectly proportional to the number of data points (Owen, 2005). The more data elements that are included the lower the level of accuracy and completeness of the data that is collected. Toth (2003) in her discussion of a nursing MDS emphasises the importance of 'minimum': *"Proliferation of clinical data owing to automated technologies brings health care professionals closer to a disabling state of information overload."* Therefore, according to Murnagham, the question should be: *"what exactly do we need to know?"*

The answer to Murnagham's question is provided by Durch and Lohr's (1993) and Thompson and Schaffer's (2002) definition of the criteria for inclusion into a minimum dataset:

i. data must serve a specific, identifiable purpose;
ii. the data must be relevant at all levels at which it is collected;
iii. data from individual records must be able to be aggregated, coded and used for its intended purposes;
iv. data should be collected routinely and not just during isolated studies;
v. the data should be easy to collect so that there is a high degree of reliability despite various levels of training among the collectors;
vi. the cost of data collection should not be excessive;
vii. there must be someway of tracking individuals in the system; and
viii. the data should not be primarily judgemental.

Furthermore each data element must be accurately defined and all possible values identified and patient data able to be documented using these elements and values

There are two common approaches to developing a MDS: Top down and bottom up. Top down is the traditional approach, which identifies and defines, through literature study and expert opinion, the elements to be included in the data set. This approach is used to identify essential information requirements. The bottom up approach gets expert opinion after the identification of potential terms, thus ensuring that all previously relevant data elements are at least considered (Thompson and Schaffer, 2002). This assists in keeping the MDS small and relevant as it is not worthwhile to spend resources collecting data that is either unobtainable or that will neither not be used for analysis or to inform decision-making (Maybloom and Champion, 2003). Both approaches were used in this study and are discussed in more detail in section 3.2.3.1.

These two approaches are compatible with current methodology on developing or revising an MDS. Two independent and unrelated recent health care data sets (women's health (Farley, Tharpe, Miller and Ruxer, 2006) and neonatal critical care (Hughes, 2006)) were both developed by expert panel consensus and authentic environment testing. This was similar to the methodology employed by Sermeus et al. (2005) in the revision of the Belgium nursing MDS, where expert panels were consulted and the four-phase study included field testing. This methodology is discussed in greater detail throughout Chapter Three.

2.7.1.2. Areas relevant for defining the patient population

An initial investigation of the literature has suggested that the following broad areas to be considered (Maybloom and Champion, 2003) in defining the EMS patient population are:

i. demographics – important for descriptive epidemiology and for race / social circumstances equality in health care;
ii. reason for calling;
iii. on scene diagnosis; and
iv. severity of the clinical condition

These can all be used to determine appropriate use of resources and provide useful health information about the community.

2.7.2. Technical requirements: data collection and data capture

Form design as a whole is a technically complex process (Jarrett, 2000a), and an in-depth discussion on this would be beyond the scope of this literature review.

However, it is necessary to identify the key aspects relevant for designing a form that is easy and appropriate to use, since this relates to the third objective of the study. In principle experts recommend a simple design with the correct layout (i.e. positioning of data elements in a logical and user friendly manner) will encourage accurate form completion (Smyth and Emmerson, 1996; Dick and Baskett, 1999). Data entry methods, manual or automatic, should be considered during initial form design as it is difficult to change once the form is in use (Jarrett, 2000a, Paulos, 2005). There are some specific design points that can be considered to make both ADE and manual data capture easier (Thompson, 1999; Jarrett, 2005a):

i. question and answer spacing;
ii. use and size of check boxes;
iii. coding methods;
iv. use of additional hand-written comments;
v. form printing colours; and
vi. block sizes.

The above points were endorsed during the Prehospital Data Conference, where it was suggested that advantage be taken of the developing technology to avoid cumbersome forms (Spaite et al., 1995). They noted that data collection should be simple, using tick-boxes and closed questions.

Certain specific problems that could affect completion and data capture are indicated on each form. General problems that may affect data capture (manual or automatic) common among the forms (Appendix A) are:

i. small blocks for hand-written numerical entry – leads to small hard-to-read characters causing time-consuming and inaccurate manual or automatic data capture;
ii. picture style data entry – very difficult to capture via either method; and
iii. the need for hand-written notes which are time-consuming to capture and are associated with a variety of terms for the same data entered.

As can be seen from Form 5 (Appendix A), most of the problems are easily resolved by improved form design. Check-boxes and large numerical character-boxes with coded options improve the speed of data collection and the speed and accuracy of data capture; the reliance on hand-written notes is reduced. The use of codes reduces the possibility of multiple descriptions for the same event; e.g. heart attack, myocardial infarction, acute myocardial infarction, MI, AMI or cardiac pain are commonly used to describe the same condition.

Ensuring that the form is simple to fill-in tends to allow for completeness of data collection (sections 5.3 and 5.4); furthermore it is possible that data was not previously captured as it was too labour intensive and time consuming to do so. Obviously degree of completeness of data collected and captured affects the accuracy and applicability of reports generated.

2.8. Conclusion

It has been clearly shown that the importance of EMS health information is widely accepted and that the development of comprehensive and integrated system has not yet been finalised. The specific importance of defining the population using the EMS on is unambiguous. Finally, the development of a tool to define the patient population requires both the determination of an appropriate MDS and consideration of the technical aspects of form design. Therefore, the literature reviewed supports the need for this research project to have been undertaken.

CHAPTER THREE: Methodology

3.1. Research design

As has been discussed in Chapter Two (sections 2.2, 2.5 and 2.6) some patient data on demographics, clinical condition and access to health care is currently collected by the EMS, but it is in a limited and unorganised manner neither conducive to sustainable data capture nor adequate analysis. Therefore the purpose of the study was to develop a data collection tool that can be used to determine the population of prehospital emergency medical care patients in South Africa. Since this involved defining the concepts to be measured, developing the collection tool with user instructions and finally testing the tool, a methodological research design was pursued. Methodological research can be defined as *"research designed to develop or refine methods of obtaining, organising or analysing data"* (Polit and Beck, 2006: 504). Polit and Beck (2006: 243) further explain that *"methodological research ... addresses the development, validation and evaluation of research tools or methods."* This research project had three phases that addressed these areas:

i. Phase One examined methods of obtaining the data by developing a minimum data set;
ii. Phase Two developed the tool and formulated user instructions; and
iii. Phase Three evaluated the tool

To achieve this, an integrated design or mixed methods study was required. As Polit and Beck (2006) note, integrated designs are well suited for the development and validation of formal quantitative instruments – the goal of this study.

For most of the study, it was necessary to use a qualitative approach by drawing upon the experience of experts in order to identify and reach consensus on the characteristics of the population required and the development of the MDS. Further, a qualitative approach allowed input into the feasibility of collecting the specific data and using the data collection tool and user instructions. The decision to adopt a naturalistic perspective was based on the appropriateness of this paradigm's assumptions for purpose of the research. The suitability of each of these assumptions, as explained by Polit and Beck (2006), is examined hereafter. From an ontological and axiological perspective it was appropriate in that the researcher was

seeking the participants' opinions on both the data that should be collected and the use of the tool. While participants were requested to provide their impartial 'professional opinion', there is no doubt that their comments and interpretations were grounded in their experiences, both prior to the development of the tool and during the use of the tool. These experiences would contribute to each individual's construct of reality, which may differ from that of other participants. This is regarded as valuable since the participants were specifically selected for their expertise in diverse settings, and accords with the interpretive paradigm in which it is recognised that reality is multiple and subjective, and is mentally constructed by individuals.

In line with the epistemological assumption of the paradigm, the researcher interacted with the participants in order to create the MDS. From a methodologic perspective, the MDS and the tool were developed using inductive reasoning processes. The project sought to develop a dataset in which all the elements together would characterise the user population as a whole. Whilst the phases were determined at the outset, the design was flexible in that it allowed for decisions on the methods and participants to be made as the project progressed. The study is context bound in that the MDS and tool have been specifically developed for the South African prehospital EMS. Narrative information was obtained and analysed using qualitative methods.

Green and Thorogood (2006) explain that *"if you want to understand the perspectives of participants, [or] explore the meanings they give to phenomena ... then a qualitative process is probably appropriate"* (p28). Thus it is shown that for attempting to answer the broad research question of describing the patient population a qualitative approach is necessary. In this project sub-questions involve considering participants' views on how to define the patient, what data is required and how to collect that data – clearly both understanding the meaning and perspective of the participants.

Green and Thorogood (2006) then further state that if specific numerical data is wanted then a quantitative element is required. Thus in the last part of the study, a quantitative approach was used for the more focused testing for completeness of data collected using the designed instrument (Hutchinson, 1989, Wilson, 1989). The

use of the positivist paradigm was appropriate because an axiological approach was used in that the values and biases of participants and researcher were not considered; the objective was determining if the elements were either completed or not. Furthermore the participants used the forms while delivering a service independently of the researcher; therefore the research followed an epistemological format. Further supporting the positivist paradigm is the overarching design of methodological research. The emphasis was on obtaining knowledge by a deductive process about discrete, specific concepts. The fixed design and measure of qualitative information and statistical analysis highlight this position (Polit and Beck, 2006).

As previously explained, the research was divided into three phases: (i) development of a minimum data set to yield the data necessary to determine the population of prehospital emergency medical care patients; (ii) developing a tool and formulating user instructions; and (iii) testing the tool. Each of these phases are described in detail in this chapter, the link between these phases is shown in Figure 3.1, which summarises the design and methodology.

3.2. Phase One

3.2.1. Introduction

This phase focussed on developing a minimum data set (MDS) that was to be collected to answer the purpose of this study: determining the population of prehospital emergency medical care patients in South Africa. This phase then formed the basis for Phases Two and Three.

This phase was divided into two parts, the initial identification of a MDS by a focus group discussion (FGD) and the subsequent refinement of the MDS using a Delphi technique. While together these two parts form the first phase, they were essentially separate research activities and are thus presented separately.

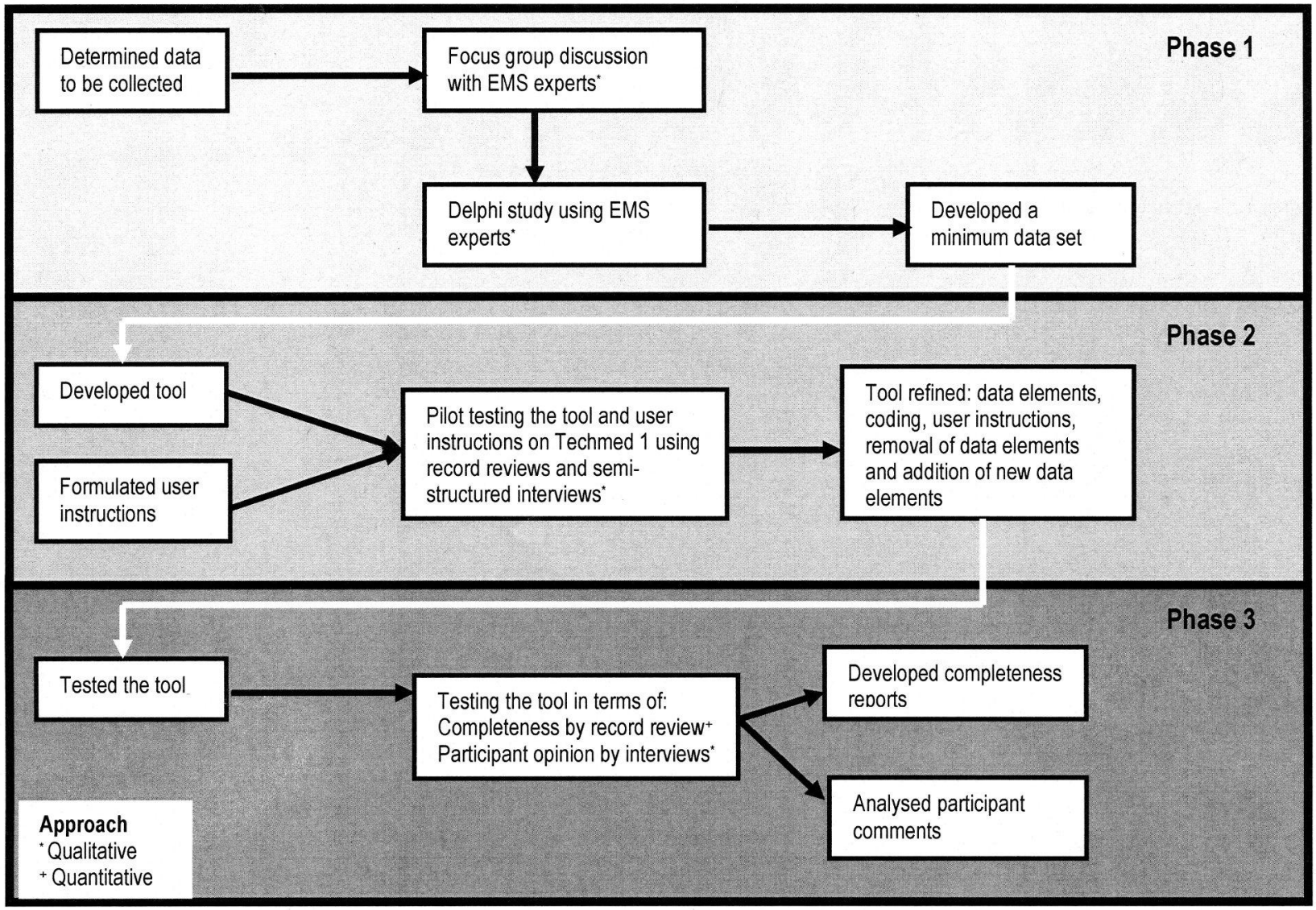


Figure 3.1: Research design and methodology used

3.2.2. Phase One, Part One

This phase was conducted to establish characteristics of interest to describe the population using the emergency medical services (EMS) in South Africa and begin development of an MDS appropriate to define the population.

3.2.2.1. Study methodology

Defining the patient population does not appear to have been a purpose of the PRF's in South Africa (as discussed in section 2.6) thus a top-down approach (see 2.7.1.1) was used to meet these outcomes. A top-down approach is used when a new list or data set must be developed; this is in contrast to a bottom-up approach (discussed further in section 2.7.1.1) where an existing list is to be modified or validated. The methodology uses expert opinion and literature study to identify the data elements that are required to define the patient population. This process starts with the aim of the study (how should the patient be defined?) and progresses to the specific data elements (what data must be collected?).

While FGD's are not commonly used to reach consensus, but rather to understand perceptions, there is some documented use of expert focus groups in consensus development. FGD's are an effective method of generating dialogue on a subject as they encourage the participants to build upon the ideas and opinions expressed by fellow participants (Rubin and Rubin, 1995). In 1968, Hess (in Vaughan, Schumm and Sinagub, 1996) noted five distinct advantages of FGD's. He described the group discussion as been synergistic, in that a wider bank of data emerges through the group interaction. This causes excitement about the topic thus stimulating further discussion and creating a snowball effect as a participant's statement initiates further comment. These first three advantages were particularly noted as the relevance of the topic became clearer during discussion and participants' statements encouraged further discussion and greater depth of data. A specific example of this can be seen in section 4.2.2.4 (and Excerpt 4.1) where a discussion involving the facilitator and five participants over 12 statements or questions resulted in the defining and quite specific justification of a data element that may otherwise have remained a general element with limited explanation. The other advantages Hess mentions is that of group security encouraging candid responses and the spontaneity that comes from not been 'forced' to answer every question (as in a individual interview).

The use of the FGD facilitated the research process in this phase of the project by firstly aiding the MDS development as the group identified and constructed data requirements that the researcher had not considered; and secondly the discussion assisted with the development of elements that were appropriate for the “real world”, the world that the experts inhabit (Vaughn et al., 1996). The research needed to be relevant to the people operating within the EMS industry and not simply important to the researcher (see section 3.2.3.8).

Participants in FGDs are usually only informed of the details to be discussed just prior to the discussion beginning in order that spontaneous responses are elicited. This approach is common in social science and marketing research where personal opinions and feelings are being sought; however, in this case specific expert opinion was required and thus preparation by the participants was essential to the effectiveness of the discussion (Vaughn et al., 1996; Greenbaum, 2000). To prepare the participants, a brief literature review (Chapter Two summarised) was emailed to each participant at least one week prior to the focus group. This literature review was a discussion on the following:

i. defining appropriate use of the emergency medical services;
ii. populations utilising the emergency medical services and the need to define them;
iii. development of a tool to collect patient data, including the determination of a minimum data set and the associated technical requirements; and
iv. current PRF’s in South African EMS.

3.2.2.2. Study setting

The FGD was held at the Department of Emergency Medical Care and Rescue (DEMCR) of the Durban University of Technology (DUT) in Durban, KwaZulu-Natal (KZN), South Africa. This setting was chosen by the researcher for its convenience to him and because Durban is a major city in KZN with a well established health care system in both the public and private sectors. Further it is well-located for assembling EMS personnel operating in both rural and urban areas of the North and South Coast and Pietermaritzburg areas.

3.2.2.3. Population

The desired population was South African EMS experts including managers, educators, researchers, operational personnel and hospital emergency department staff from the private and public sectors.

3.2.2.4. Sampling strategy

According to Polit and Beck (2006: 271) purposive sampling is “a strategy in which researchers hand pick the [persons] or type of [persons] that will best contribute to the information needs of the study.” Thus as the researcher needed to have a varied and well informed mix of participants, he selected potential participants, identified through his industry knowledge. These participants came from EMS operational and strategic management, education, clinical governance, research and hospital emergency departments in the private and public sectors. Not all potential participants were personally known to the researcher, as they were selected by virtue of the positions that they held in these departments.

3.2.2.5. Composition of Focus Group

Experts who conduct focus group discussions as an occupation define a full-group as 8 – 10 participants and 4 – 6 as a mini group (Greenbaum, 2000). The researcher attempted to create a group of 8 – 12 experts from the above-mentioned specialist groups of management and oversight, education, varied clinical settings and research to ensure heterogeneity within the field of EMS. Thus purposive sampling of South African EMS experts was conducted to ensure maximum variation of experts’ industry experience. There were, however, difficulties in gaining the desired participation: the medical practitioner owners of two large private hospital emergency departments were contacted but were unable to participate due to their time constraints (possibly as they operate on a fee-for-service policy). The chief medical officer of a main public hospital in Durban cancelled minutes before the FGD was to start, as did the operational advanced life support participants from both the private and public ambulance services – no reasons were given. The focus group finally comprised of seven EMS expert participants (between a mini- and a full-group). Additionally, since the date of the FGD coincided with the visit of an international EMS expert, this person was also able to participate.

All participants have had some clinical/operational experience and all are currently in full time employment in the prehospital EMS sector. Table 3.1 indicates the participants' level of qualification and experience. For the purposes of this study "local" is defined as participants from Ethekwini metropolitan area and the adjacent districts of Umgugundglovu, Illembe and Ugu. The past and current positions, settings and sectors in which the participants have worked are shown. It is evident that despite a poorer than expected turnout, a good mix of participants was obtained.

Table 3.1: Focus group discussion participant mix

Participants	EMC qualification			EMS role				Geographic setting		Sector	
	Medical practitioner	ALS paramedic	ILS provider	Clinician	Educator	Manager	Researcher	South Africa	International	Private	Public
1		√		√	√		√		√		√
2		√		√		√		√			√
3			√	√		√		√			√
4		√		√	√		√	√		√	√
5		√		√	√	√	√	√			√
6	√			√		√		√			√
7		√		√		√		√		√	√
	1	5	1	7	3	5	3	6	1	2	7

3.2.2.6. Data collection

3.2.2.6.1. Development of the FGD tool

As the success of a FGD is directly related to how clearly the goals are defined, an interview guide was developed based on the literature studied (Maybloom and Champion, 2003; Ferguson, Davis, Slutsky and Stewart, 2005) to assist in the establishment of the characteristics of interest for the population using the EMS and to develop a MDS to define these characteristics (Thompson and Schaffer, 2002). The following questions were formulated for use as a semi-structured guide to assist the facilitator in keeping the group focused (Vaughn et al., 1996; Ulin, Robinson and Tolley, 2005).

i. *How should the population be described, what is it that we want to know about the population?*
ii. *Why do we want to know about the population? How will it benefit EMS and our patients?*
iii. *What data do we need to collect to describe the population?*

iv. How feasible is it to collect the required data?

3.2.2.6.2. Pilot study of FGD

On the 23 March 2006, a pilot study FGD was held with a group of EMS experts familiar with the research (one of whom was later in the actual FGD). This pilot study was used to test the interview guide, and assess or develop the skills of researcher and research assistant in their roles as moderator and scribe respectively. The research supervisor provided the assessment and training. It was found that the interview guide encouraged meaningful discussion on the topic while remaining clear and unambiguous, and that the researcher had the required skills for moderating a FGD.

3.2.2.6.3. The focus group discussion

The expert group met at the DEMCR, DUT on April 24 2006 from 14:00 to 15:30. In accordance with qualitative research methods, a moderator (function performed by the researcher) and scribe were present during in the FGD. The researcher performed the function of the moderator; opening and closing the discussion and refocusing the group where necessary. The research assistant (scribe) holds a Bachelor of Technology degree in Emergency Medical Care, was employed as a technician in DEMCR at the time and had some graduate level research experience. For the purposes of trustworthiness and to guide the research process where necessary, the research supervisor acted as auditor for the discussion

A comfortable environment is essential for a focus group to be effective; this requires a relaxed social environment in a professional setting (Rubin and Rubin, 1995; Greenbaum, 2000). Thus the participants were introduced to each other and served light refreshments. The roles of the researcher, supervisor and research assistant were given as moderator, auditor and scribe respectively (Ulin et al., 2005). The researcher explained that he had invited the participants to this discussion as he wished to use their collective input in the development of a tool to define the patient population using the EMS.

It is essential that the participants are aware of the purpose and the rules of behaviour for the discussion so that all participants can feel at ease with expressing

their opinions and can comment with relevance to the topic (Vaughn et al., 1996, Greenbaum, 2000; Ulin et al., 2005). Thus the following rules of the FGD were stated:

i. the opinions and confidentiality of all participants must be respected;
ii. confidentiality agreement and informed consent forms must be signed (3.2.2.9);
iii. a voice recorder will be used and a research assistant will take notes of the group discussion;
iv. the facilitator will use a white board to list ideas on the board as they develop within the group; and
v. participants may withdraw themselves or their comments at any time during the study.

Members of the group had been sensitised to the topic under discussion and should have done some reading on the subject by reading through the literature supplied to them. Prior to beginning the discussion it was found that some members had even done some independent investigation in preparation of this discussion. The topic was introduced to the group by the facilitator reading the following:

Health systems need information regarding the population that are using the services provided; the emergency medical services (EMS) are no different. This information can be used across a broad spectrum – politicians and strategic managers to gauge equitable service delivery, operational managers to assess appropriate use of resources, educators to revise curriculum and researchers to target specific areas of need. It is apparent that we in South Africa do not know, with a few exceptions, the population using the EMS.

The aim of this research is to develop a patient report form (PRF) that collects the data to describe the characteristics of the EMS patient population while still meeting the clinical, legal, financial and administrative requirements of the services. This focus group will concentrate on the characteristics of the patient population, leaving the other PRF data for the email discussion.

The moderator followed the guide (discussed in section 3.2.2.6.1) and started the discussion by asking the participants how the patients should be described. As the

participants made suggestions the moderator made notes on the whiteboard and asked probing questions as applicable; the auditor only entered the discussion when there was an issue that needed clarification. The probing questions and request for clarification followed the sequence of the guide by encouraging discussion on what data is needed, how feasible it is to collect and what its benefit will be to describing the patient population. This is shown in the Excerpts 3.1 and 3.2. In Excerpt 3.1 the moderator questions the participant, encouraging elaboration. This leads to further discussion by the other members; and consequently richer data. In Excerpt 3.2 the moderator encourages the group to move on to the next data element, and the auditor clarifies a point of potential confusion.

Participant 2:	*"Location"*
Moderator:	*"What specifically do you want from location?"*
Participant 2:	*"Something common to a specific area may indicate a specific problem in a specific area"*
Participant 3:	*"Need to determine how you would annotate it. Local municipality or municipal ward; if it is electronic PRF then wards, but for paper based local municipality would be simpler."*
Participant 6:	*"Determine local vs. rural"*
Participant 5:	*"Go as low as possible; local municipalities are better than districts as some districts contain both urban and rural conditions. It is important to get a feel of urban and rural."*
Participant 2:	*"Ethekwini has to operate within the DHIS from 1st April. Currently Ethekwini captures calls according to EMRS zones and not according to the local municipalities."*
Participant 7:	*"Calls should be classified according to ambulance bases. This is better for billing, profitability and to determine what is coming out of these areas."*
Moderator:	*"What would be the best?"*
Participant 7:	*"Bases would be better for data capture and would be at a much lower level."*
Participant 6:	*"Depends on what we want to capture"*
Participant 7:	*"We want to analyse disease profile, and work with the DHS. Therefore we need to work with sub-districts (KZ's) or local municipalities"*

Excerpt 3.1: FGD showing moderator probing

Moderator:	*What other info do you need?*
Participant 6:	*Ethnicity, gender.*
Moderator:	*Race and gender speak for themselves.*
Auditor:	*There is a difference between ethnicity and race. What is meant here?*

Excerpt 3.2: FGD showing moderator guiding discussion and auditor clarifying a point

Apart from clarifications the auditor just listened and made notes. The research assistant did not participate at all in the discussion, but took notes and made observations. At no point did the moderator need to step in to encourage participation from any participant or to refocus the discussion.

The FGD ended with the identification of broad categories under which the patient population should be described and the development of a list of data elements that could guide the data collection. This is discussed in more detail in the presentation of the findings in section 4.2.2.

3.2.2.7. Data analysis and interpretation

The discussion was recorded with two voice recorders; notes were taken by the scribe and auditor; and key discussion points were outlined on the whiteboard during discussion. Unfortunately the quality of both recordings was poor in places, so that a few words were inaudible. However, the researcher correlated the data gained from the audio recordings with the written notes to create a transcript of the discussion. This is acceptable within both health and marketing focus group analyses (Greenbaum, 2000; Ulin et al., 2005). From this transcript the researcher analysed and categorised the data, two days after the FGD while the conversation was still fresh in his mind; thus better able to understand the audio and written notes (Greenbaum, 2000). Many of the analysis methods described in texts on FGD's are useful for analysing personal opinions and feelings, however as this study is about generating professional / expert opinion for the purpose of developing a MDS to define the patient population, an adaptation to the analysing methods has been made, is and detailed below (Vaughn et al., 1996).

As previously stated, the FGD aimed to identify and describe potential data elements for inclusion in the MDS. Only at the end of the second part of this phase (Delphi study discussed in section 3.2.3) would the data elements for the MDS be decided on. Thus minimal data analysis and interpretation was conducted at this stage. The analysis that was conducted followed Vaughn et al's (1996) five step approach: (i) identifying the big ideas, (ii) unitising the data, (iii) categorising the data, (iv) negotiating categories and (v) identifying themes and use of theory. The big ideas were those ideas that occupied the FGD and provided the initial framework for the

findings. Unitising the data is the process of identifying units of information as a basis for defining categories to assist the researcher to better answer the research question; this was almost completed in the flow of discussion and led to categorisation of these units in the summary of the FGD. The remaining two steps were done by the researcher. Categories were negotiated as the researcher compared the big ideas presented in the FGD with his analysis of the audio and written recordings. The researcher then, with the assistance of the supervisor, identified which theory to use during data interpretation.

As this phase of the study only considered professional opinion and clinical data, rather than personal feelings or emotions, there was limited coding to be done (in contrast with many FGD's). The data consisted of a list of data elements based on professional opinions. Minimal clarification of participants' meanings and opinions was required, thus the data was simpler to analyse. As the participants had already assisted with the analysis the researcher had to simply ascertain that nothing was missed; this was done by literature study. The results are discussed in section 4.2.2 and shown in Table 4.1.

3.2.2.8. Trustworthiness

The final two steps of data analysis (audit and member check) were performed to establish trustworthiness: The transcript was audited by the supervisor and corrections made as required. This was followed by member checks where each participant was emailed the summary of the FGD and asked for confirmation on its accuracy; no corrections were noted. Dependability and confirmability are established by a clear decision trail; this is shown throughout Chapter Four and in the researcher's notes (available for review if required).

Polit and Beck note that *"if there is to be transferability, the burden of proof rests with the researchers to provide sufficient information to permit judgements about contextual similarity."* (2006: 277). The researcher is convinced that the findings presented in Chapter Four "*provide sufficient information to permit judgement"* and that the use of diverse and well experienced participants for the FGD (Table 3.1) allow for transferability of results (Vaughn et al., 1996).

3.2.2.9. Ethical issues

Participants were contacted telephonically by the researcher; the study was briefly explained to them and their participation was requested; there was no coercion of any form. On acceptance of participation in the FGD an information letter (Appendix B) was emailed to the participants. All participants were asked to sign informed consent and a confidentiality agreement, with the main purpose of protecting the other participants' privacy, (Appendices C and D) prior to the commencement of the discussion. The participants were advised of their rights to withdraw themselves or their comments at any stage.

No names of the participants have been linked to any focus group or email communication; neither have they appeared in the write up of this research. Where curriculum vitas have been used to demonstrate expertise, identifying details have been removed. All email correspondence, voice recordings and transcripts have been kept in a secure archive.

3.2.2.10. Limitations

Initially the focus group was to consist of 8 – 12 experts from across the EMS spectrum. However it proved impossible to gain participation from private hospital staff (apparently due to work commitments); and there were last minute cancellations from public hospital staff, and some private and public sector prehospital EMS staff. The group finally comprised of seven EMS expert participants. Nevertheless, as illustrated in Table 3.1 a good mix of participants was obtained, with a combined EMS experience of over 100 years. While it is acknowledged that there was poor private service representation, this imbalance was corrected in the Delphi study. This should not have a significant impact on the results as the MDS development was spread over both the FGD and the Delphi study. Attendance is a common concern in establishing focus groups, thus participants are often awarded a cash incentive or gift (Vaughn et al., 1996). While this approach may be considered ethical in marketing or business research it certainly is not in health research. Further the researcher is of the opinion that, due to the professional status of the potential participants, incentivisation would not have increased the size of the group. It does however highlight that the difficulties experienced in obtaining the participants the

researcher was aiming for and is a common problem in this type of research (Vaughn et al., 1996; Greenbaum, 2000).

Despite the use of two voice recorders, the quality of the audio recordings was not of sufficient standard to allow for transcription of every word spoken during the proceedings. Thus the researcher combined the data gained from the audio recordings and the notes taken by the scribe. However this was not regarded as a serious problem as the FGD auditor (research supervisor) was satisfied that the transcript was a fair and accurate account of the discussion. Additionally, member checks were held to verify the data. It is common that transcriptions of FGD's do not always contain every word of every participant; in fact some focus group reports are based only on notes, no audio recording is taken (Vaughn et al., 1996; Greenbaum, 2000; Ulin et al., 2005).

3.2.2.11. Conclusion

The FGD provided valuable information for use toward the development of an MDS and became the foundation for the Delphi study.

3.2.3. Phase One, Part Two

The purpose of this second part of the first phase was to build on the outcomes of the FGD and complete the development of the MDS. This allowed for refinement and ensuring of completeness of the data set.

3.2.3.1. Study methodology

In order to achieve the aim of Phase One of the study, the FGD was followed by an email-based four-round Delphi study. The Delphi technique (Rand Corporation, 1950) is often used in health and other research to gain consensus among experts. Experts are questioned individually by written means (post or email) over several rounds. A summary of the views are circulated with each subsequent round, thus generating more discussion and attempting to gain some consensus. Panellists are aware that they are part of a group process but are blinded to the authorship of specific viewpoints (Green and Thorogood, 2006; Polit and Beck, 2006). This approach was chosen as it performs well in structuring group communication (allowing all panellists an equal voice) and decision making; it is effective as a base

for strategic planning; and its low costs assist with overcoming temporal and geographical constraints (making national and international participation feasible) (Brender, Nohr and McNair, 2000). The duration between rounds allows for a longer-term thought process than interviews or FGD, thus potentially leading to better thought-out responses and insights on the topic under discussion (Keeney, Hasson and McKenna, 2001; Ferguson et al., 2005).

In contrast to the first part of this phase, where a top down approach was used in the FGD, a bottom up approach (see section 2.7.1.1) was followed for the Delphi study. A bottom up approach was the logical route to follow as the focus group had already developed a list of possible data elements required for patient population description. Additional elements were added to this list following a literature study and analysis of current PRF's. This method was used to obtain expert opinion to ensure that the list of data elements was complete, to rationalise the list to only those data elements key to describing the patient population and to reach a consensus on an appropriate MDS (Thompson and Schaffer, 2002).

Prior to using a Delphi approach to research it is important to be aware of a few points which may cause concern regarding the scientific value of the results if the researcher is unfamiliar with the technique. It is accepted that the Delphi technique may involve some subjectivity on the part of the researcher; however this is not considered to be a significant concern as individual expert opinion is also based on a subjective opinion and researcher subjectivity was limited by the use of member checks, an audit trail, and direct cutting and pasting of panellist comments (Boutron, Moher, Tugwell, Giraudeau, Poiraudeau, Nizard and Ravaud, 2005). Further, few researchers use a uniform method of the technique. Keeney et al. (2001) quote ten studies by nurse researchers from 1990 to 1999 where the Delphi technique was not used in the same way in any of them. They concede this may well be considered a weakness of the method, despite it being common and accepted in both questionnaires and interviews. They do however conclude that following a review of *"the advantages and criticisms of the Delphi that the arguments are no stronger or no more valid on one side than the other"*; and that if used *"this technique must be evaluated against the proposed study and advantages over other methods"* (199). Further they suggest that "*other criteria such as transferability, credibility,*

applicability or confirmability of results may be more appropriate." (198). Goodman (1987 in Keeney et al., 2001) states that content validity can be assumed if the panellists are representative of the field; and Ono and Wedemeyer (1994 in Keeney et al., 2001) showed that a Delphi study can be repeated (with different panellists) and produce the same results. Thus it can be accepted that if the four key aspects, essential for a strong Delphi study: (the use of experts, anonymity, iteration with controlled feedback and aggregation of responses (Keeney et al., 2001)) are present then the results developed will be a valid consensus of experts.

Anonymity was guaranteed by the panellists responding directly to the researcher and no names being supplied with feedback on subsequent rounds. This was a four round Delphi study and panellists comment from previous rounds was included (by cutting and pasting) in subsequent rounds. Finally there was a qualitative aggregation of responses. These last two aspects are discussed in greater detail in section 4.2.1 and Appendix E. It must be restated here that the Delphi technique is suitable, and often used, for qualitative studies.

Traditionally Round One is used to generate ideas, therefore panellists are asked for their comments about an issue, and Rounds Two to Four are more structured, incorporating feedback to each panel member. There is now some support for revising the approach and providing pre-existing information for response. This approach could bias the response but has the advantage of being more efficient - important in a usually very time consuming research method (Jerkins and Smith, 1994). In this study this modified technique was followed; bias being reduced by using the FGD data as the pre-existing information.

Ferguson et al. (2005) mention that the degree of consensus that should be reached has often been poorly defined, but then state that this may be arbitrary as consensus will likely vary significantly between studies. Keeney et al. (2001) agree with this and counter that the existence of consensus does not mean that the correct answer has been found. These points are not necessarily limitations of the Delphi technique, but rather the framework in which a researcher must operate if he chooses to use this method. As mentioned above, it is an excellent way of allowing participation of a large group of experts. It may be necessary to triangulate data to ensure that the

results are accurate and to limit bias. This has been done in this research project: the FGD results were augmented by a literature review prior to being fed into the Delphi study. The literature searching continued in conjunction with the Delphi process; this was followed by the pilot testing of the tool (Figure 3.1). Thus this study did not stop with the development of the MDS (Phase One, section 4.2) but went on to further validate the tool by literature review and trialling (Phase Two, section 4.3).

Initially, this research aimed to develop a MDS to define the patient population and to develop a complete PRF that would meet the data requirements for administrative, financial and legal needs of the EMS. However in the first round of the study the participants expressed concern about the size and scope of the project (section 4.2.1.2). Thus, from the second round, it was reduced to only the development of an MDS for description of the patient population.

3.2.3.2. Study setting

When using the Delphi technique, the setting cannot be controlled as the participants are removed from the researcher. However it can be assumed that the participant is in an environment comfortable to themselves (usually either work place or home) as participants had selected it themselves.

3.2.3.3. Population

National (based in South Africa) and international EMS (based outside South Africa) experts; including managers, educators, researchers, operational personnel and hospital emergency department staff.

3.2.3.4. Sampling strategy

With the aid of email lists the researcher identified and contacted as many EMS personnel as possible. A snowballing technique was also used as potential participants were encouraged to forward the email to other colleagues or refer the researcher to potential participants. Some, but not all of the participants, were known to the researcher through his experience in the industry. The email lists were gained through the researcher's personal contacts and group email servers (e.g. twrparamedics@yahoogroups.com).

Over 400 potential participants were contacted via email and requested to participate in this phase of the research project and refer other potential panellists; 44 persons volunteered their participation (one specifically mentioned that he had been referred to participate). Although the panel size was initially set at 15 – 30 members it was decided, owing to the expected panel member drop-out (Keeney et al., 2001), that both convenience and purposive sampling would be applied and all 44 were selected as panel members. A convenience sampling strategy was used as all 44 persons who offered participation were accepted as participants; however those volunteering their services were from a group specifically selected (Ferguson et al., 2005) because of their involvement within the EMS industry and access to email, thus being purposive (Polit and Beck, 2006).

3.2.3.5. Participants

The researcher decided to accept all 44 EMS personnel who initially agreed to participate, despite a desired group size of 15 – 30 participants. As discussed by Ferguson (2005) it was anticipated that panel member drop out would be quite high. This decision was vindicated when only 18 persons eventually participated in one or more rounds. There is no uniformly recommended number of panellists when using the Delphi technique; in fact Miro, Huguet and Nieto (2007) are of the opinion that 30 is the correct number while Cramer, Epstein, Sheps, Schechter and Busser (2002) argue that 13 is the optimum number for a single researcher so as to balance the validity of the group consensus and management of the Delphi process. Thus the accepted group of 44 was too large and the final group of 18 a compromise between the 2 views.

As shown by Table 3.2, the group had sufficiently varied experience in the EMS industry and all could reasonably be expected to make a meaningful contribution to the development of the MDS.

Table 3.2: Delphi study participant mix and level of participation

Participants	EMC qualification				EMS role				Geographic setting		Sector		Delphi participation			
	Medical practitioner	ALS paramedic	Professional nurse	ILS provider	Clinician	Educator	Manager	Researcher	South Africa	International	Private	Public	Round 1	Round 2	Round 3	Round 4
1		√			√		√			√	√		√	√	√	√
2			√					√	√					√		
3		√	√		√	√		√		√		√		√		√
4		√			√		√		√		√		√	√		
5				√	√				√					√		
6		√			√					√	√		√			
7			√		√										√	
8	√				√		√	√	√			√	√	√		
9				√	√		√		√			√		√	√	
10	√	√			√										√	
11	√				√		√		√		√			√	√	√
12		√			√	√		√	√			√			√	
13		√			√	√	√	√	√			√		√	√	
14		√			√		√		√		√				√	
15		√			√		√	√		√		√		√	√	√
16		√			√		√		√			√		√		
17		√			√			√		√			√			
18		√			√	√		√	√				√	√	√	
Total	3	12	3	2	9	4	9	8	11	5	5	7	6	12	10	4

3.2.3.6. Data collection tool and methods

As is typical of the Delphi technique, this study consisted of four rounds. Cramer et al. (2002) suggests that Delphi reliability, when dealing with group consensus, increases with each round but so does responder fatigue. This was evident in this study (section 4.2.1). A reply was requested after 10 days, reminders were sent a two weeks.

Figure 3.2 shows a schematic of the Delphi study. As indicated we can see that each Delphi questionnaire had a specific purpose with related tasks for the panellist. The panellists' inputs were analysed and the findings discussed in the next round. In Rounds Two and Three the comments from the previous rounds were included, whereas in Round Four only the analysis (of Round Three) was included in the questionnaire. Each round is discussed individually below.

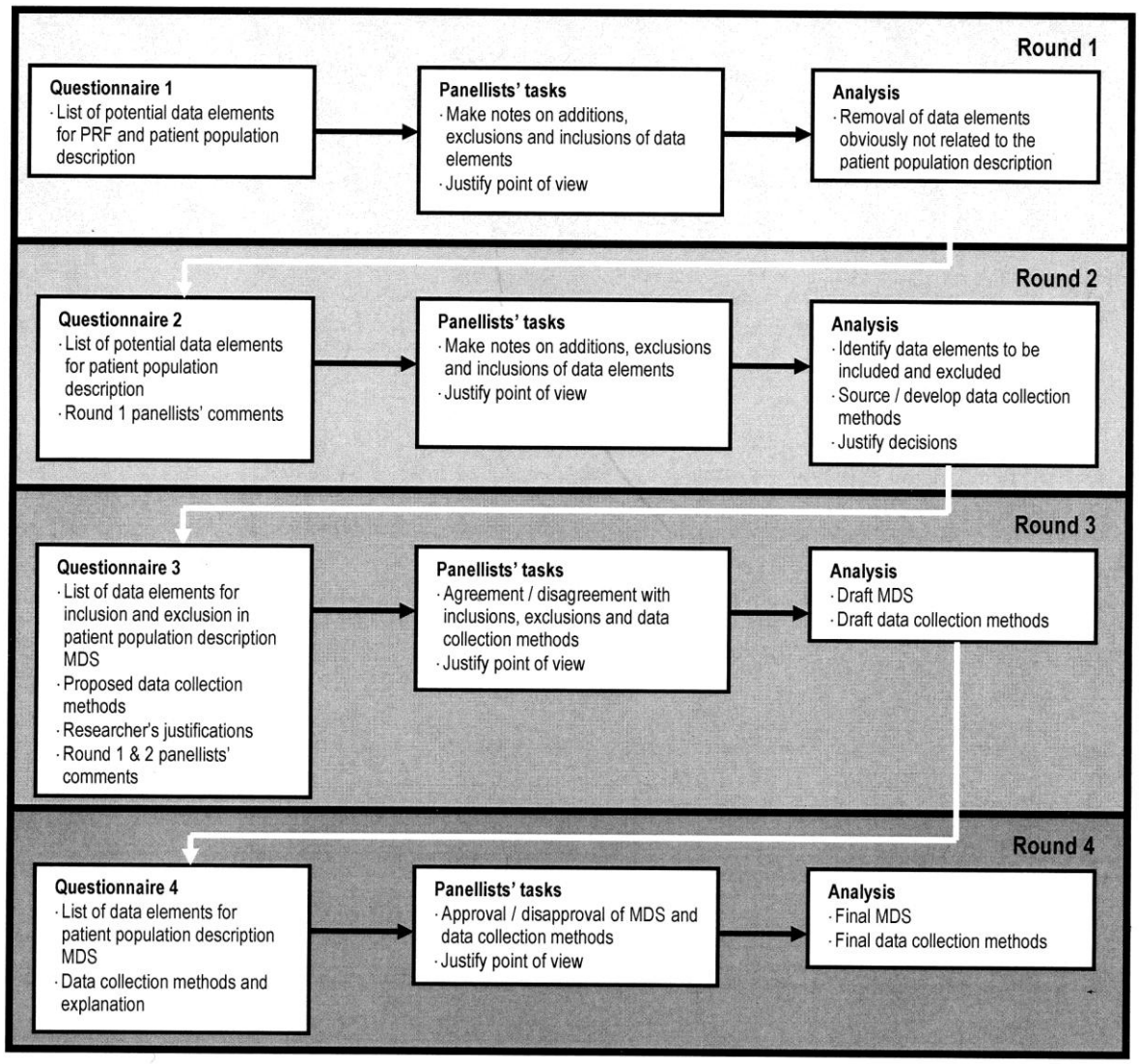


Figure 3.2: Schematic diagram of Delphi study

3.2.3.6.1. Round One: 23 July 2006

The panellists of the Delphi study were presented with a list of possible data elements for inclusion (Table 4.1 & Appendix E). This list was comprised of the FGD results and items identified by the researcher from a literature study and analysis of existing PRF's. The following statements and instructions were included in this round.

i. *The aim of this research is to develop a patient report form (PRF) that collects the data to describe the characteristics of the EMS patient population while still meeting the clinical, legal, financial and administrative requirements of the services.*

ii. *The purpose of this email discussion, in which you are participating, is to come to a consensus on what data should be collected to reach the aims.*

iii. *Study the proposed list of data to be collected on the PRF and make comments on:*

   a. *any data that should not be collected (removed from the list); give reasons;*
   b. *any data that are very difficult / impossible to collect accurately;*
   c. *any data that should be collected but that is not on the list; and*
   d. *any other ideas / thoughts about capturing the required data.*

3.2.3.6.2. Round Two: 15 August 2006

This round was similar to the first round, with the comments provided in Round One included. Comments were cut and pasted to avoid researcher bias as a result of editing. There was, however, a significant change in the aim of the Delphi study. Initially (Round One) an attempt was made to develop a MDS for patient population description while ensuring a complete PRF. Following analysis of Round One (section 4.2.1.2) it was decided to concentrate only on the patient population data and not the entire PRF. Certain elements describing personal identification or administrative data were removed (Table 4.1, section 4.2.2 and Appendix E); data analysis between Delphi rounds is supported by researchers (Verhagen, de Vet, de Bie, Kessels, Boers, Bouter and Knipschild 1998). They state that this analysis may subsequently lead to changes in the next round and that this is acceptable so long as the adjustments are justified. The introduction to this round and panellists' instructions, as shown below, indicate these changes.

i. *Based on feedback from the first round, there is a significant change to the purpose for this email discussion group of EMS experts. The purpose of whole research project is to develop a minimum data set to describe the characteristics of the EMS patient population. Ultimately (but not during this study) this data set should be able to be integrated into the patient report forms of all EMS in South Africa; electronic or paper, private or public, ground or air. Integration of this data will allow for an in-depth description of the EMS patient population. The purpose of this email discussion, in which you are participating, is to come to a consensus on what data should be collected to define the patient population.*

ii. *Study the proposed list of data to be collected to determine the EMS patient population and make comments on:*
    a. *any data that should not be collected (removed from the list), give reasons;*
    b. *any data that is very difficult / impossible to collect accurately, suggest ways for the difficult data to be collected if possible;*
    c. *any data that should be collected but that is not on the list; and*
    d. *any other ideas / thoughts about capturing the required data.*

3.2.3.6.3. Round Three: 12 September 2006

An analysis of the panellists' input was conducted and data elements assigned to be either included or excluded from the patient population MDS. Three tables were developed for this round (Appendix E). The first table (included data elements) had three columns: (i) data element, (ii) researcher's justification and (iii) proposed data collection method. The researcher's justification described the reasons for including the particular element and discussion on methods of data collection. The second table listed the excluded data elements with the researcher's justification. In the final table all data elements from the second round were listed along with the panellists' previous comments. The panellists were requested to study the tables and submit their judgment if they disagreed with the placing of the data (i.e. excluded, but they were of the opinion that it should be included or vice versa). They were also asked to give input on the data collection and classification.

This methodology is in line with that in used by researchers in developing lists by expert consensus (Verhagen et al., 1998; Boutron et al., 2005). Verhagen et al. (1998) employed a very similar process when using the Delphi technique to obtain consensus among experts in developing a criteria list for quality assessment of randomized clinical trials for conducting systematic reviews. In the first two rounds of their Delphi study the panellists were requested to note their agreement or disagreement with items in the list and to offer new or reworded items. In the third round panellists were presented with a list of reworded items for inclusion and a list of excluded items. They were asked to give comment on the rewording and state whether they agreed or not with the inclusion and exclusion lists.

3.2.3.6.4. Round Four: 5 October 2006

In this, the final, round panellists were sent a table containing 16 data elements, corresponding data collection methods and some explanation of the data element or collection method (Appendix E). Participant comments were not included this time. The panel members were given the following instructions.

i. *Please study the table of data elements to be collected, the collection method and any explanation.*
ii. *If you have any opinion or insight regarding this dataset, please submit your comment. All input will be of value for the test phase.*

3.2.3.7. Data analysis and interpretation

Qualitative analysis, according to Polit and Beck (2006: 397), is *"a labour-intensive activity that requires creativity, conceptual sensitivity and sheer hard work"* Interpretation is defined as *"The process of making sense of the results of a study and examining their implications"* (Polit and Beck, 2006: 502). These appear to be two separate activities; however, this is usually not the case in qualitative studies where analysis and interpretation are ongoing and coincide with data collection (Patton, 1987, Rubin and Rubin, 1995). In the approach to this study, data collection, analysis and interpretation occur in parallel and interact continuously – a process that was adopted for this study (Polit and Beck, 2006).

When Delphi studies are used for collection of both quantitative and qualitative data a concern is raised by Keeney et al. (2001: 198) that *"little guidance exists in relation to the balance the data collected …* [thus leading] *to a variety of approaches…"* Verhagen et al. (1998) and Boutron et al. (2005) note that the qualitative data is generally analysed by reporting on the panellists' comments while quantitative data is usually developed from the results of a Likert scale.

In this study the researcher elected not to use a Likert scale as he was not using a quantitative approach in this phase of the research. This position is justified based on the expected a high attrition rate the significance of any statistical value could well be queried. This view was vindicated by the varying number of responses of panellists participating in Rounds One to Four respectively: 6, 12, 10 and 4. The analysis rather focused on the qualitative responses of the panellists (Verhagen et

al., 1998; Boutron et al., 2005). Following the first round, analysis, interpretation and refinement of the study was conducted (3.2.3.6.2) this was followed by assigning data elements to be included or excluded in the MDS at the conclusion of Round Two. This assignment of elements was based on participant comment and the level of negative or positive comment received (Ferguson, et al, 2005). Analysis of Round Three considered individual comment and the overall negative or positive response to each data element prior to the researcher making any amendments to the proposed data set. (Keeney et al., 2000).

Detailed descriptions of the methods used in qualitative analysis in studies are frequently not provided. A recent search (25 November 2007) in Elsevier's ScienceDirect (www.sciencedirect.com) of journal articles within the health professions, nursing and medicine fields over the past 10 years revealed 26 articles containing the terms "Delphi method" and "consensus technique" in the title, abstract and keywords. Of these 26 articles, only 6 referred to qualitative data analysis (Verhagen et al., 1998; Randall, Vrijhoef and Wilson, 2002; Gentilini, Bernardi, Bolondi, Craxi, Gasbarrini, Ideo, Laffi, La Villa, Salerno, Ventura, Pulazzini, Segantini and Romanelli, 2004; Krause, Viljoen, Nel and Joubert, 2006; Griffith, Hogg-Johnson, Cole, Krause, Hayden, Burdorf, Leclerc, Coggon, Bongers, Walter and Shannon, 2007; Payne, Nicholls, McAllister, MacLeod, Ellis, Donnai and Davies, 2007). Qualitative analysis was only performed in two of these studies (Verhagen et al., 1998; Krause et al., 2006) and in neither was it well described. Thus the researcher was compelled to develop his own strategy of data analysis; in harmony with Crabtree and Miller's (in Polit and Beck, 2006: 397) observation that *"there are nearly as many qualitative analysis strategies as there are qualitative researchers."*

While *"the aims of most qualitative analysis are to both reflect the complexity of the phenomena studied and to present the underlying structures that make sense of that complexity"* (Green and Thorogood, 2006: 175); this is not the case in this analysis. For the most part, the researcher was not attempting to unpack the panellists' responses in a search for a deeper meaning, but was rather aiming to learn from the panellists' experiences in identifying necessary data elements, conceptualising them, their method of collection for determining the patient population and justification for inclusion. Since the analysis style is influenced by the aim of the project (Green and

Thorogood, 2006) this analysis followed an editing style where the researcher read through the text searching for meaningful segments and then categorising this data. In addition, the method of constant comparison (of the individual responses in each Delphi round) and identification of data for "fit" in the categories developed (Polit and Beck, 2006) was used. Data was analysed after each round and the analysis offered to the participants in the subsequent rounds. The researcher and participants (panellists) were thus able to work together to develop a MDS.

3.2.3.8. Trustworthiness

The degree of confidence that the researcher, or a reader, can have in results is dependant on the credibility, transferability, dependability and confirmability of the data. The credibility of the data was established using member checks in Round Four (section 4.2.1.5). According to Lincoln and Guba (in Polit and Beck, 2006) member checks are the most vital activity in establishing credibility. Another method is data source triangulation (discussed in 3.2.3.1) which occurred over the duration of the entire project.

Patton (in Polit and Beck, 2006) notes that researcher credibility is essential as he is the data collecting instrument and the creator of the analytic process. The researcher stakes his credibility on work experience in EMS (management, clinical / operational and educational) and his education in the field; this is shown in the researcher's biographical profile (Appendix F). The researcher is aware that some of his own preconceived ideas and intimate involvement with the research process may have led to bias in result interpretation; however the researcher actively attempted to avoid this. This was done by supplying the participants with the same literature as he used, following a continuous process of member checks and auditing by the research supervisor (Green and Thorogood, 2006; Polit and Beck, 2006).

Transferability is dependent on design and sampling (Polit and Beck, 2006). The design of this Delphi study is congruent with the design of other Delphi studies developing tools or instruments in the health sciences (see section 3.2.3.1). Sampling is discussed in both sections 3.2.3.4 and 3.2.3.10 – it is important that participants selected be knowledgeable in the field, with a keen interest in furthering the profession. As a wide variety of participants was used, it can be assumed that

obtaining a “good mix” of participants will lead to similar results in the specific are of the industry. Furthermore this study was not limed to local participants and thus can be expected to be relevant to all sectors of South African EMS industry.

The remaining two measures of trustworthiness are confirmability and dependability (Polit and Beck, 2006). The confirmability of the data is established by the availability of raw data, and the data reduction and analysis products for scrutiny. These can be seen in the various rounds of the Delphi study (Appendix E), in Table 4.1 and researcher’s notes (available on request). Dependability of this data is shown by the decision trail followed to reach the conclusions of this part of the study. The decision trail is covered in both the methodology (section 3.2.3.6) and the findings (Table 4.1 and section 4.2). The inquiry audit was conducted by the research supervisor who viewed both the responses and the questionnaires of each round.

3.2.3.9. Ethical issues

All participants received information letters (Appendix G) and were informed that replying to the email would be taken as informed consent. The participants were informed that they were free to withdraw themselves or their comments at any stage. At no point was any pressure placed on panellists to participate in this study. No names of the participants have been linked to any comments sent out in email communication or reported in the findings. All raw data has been kept in a secure, password protected computer.

3.2.3.10. Limitations

The two possible limitations in this Delphi study were regarding the selection of panellists: (i) although a purposive sample was conducted, the population was limited to those with deliverable email addresses; and (ii) the method of panellist selection had some resemblance to a convenience sample of volunteers (Polit and Beck, 2006). The researcher did not receive sufficient expressions of interest to select the best possible panellists from the respondents - all whom agreed to participate were included. Obviously the choice of participants is crucial in consensus procedures (Verhagen et al., 1998) and the researcher was limited in his choice. Despite this we cannot simply discount the value of the panellists as Keeney et al., (2001) describe an expert as an informed individual or a specialist in his field.

Furthermore, some of panel members have proven research experience in the EMS. It should also be considered that those who agree to participate have an interest in research and the topic under discussion.

3.2.3.11. Conclusion

While the Delphi technique may have a number of potential limitations, both generally and specifically (discussed in sections 3.2.3.1 and 3.2.3.10); this method was, however, very effective in gaining expert opinion and consensus (Keeney et al., 2001), and refining the data of the FGD (detailed in 4.2) through the use of the framework that is described in 3.2.3.1. The use of the Delphi technique allowed for expert "discussion" on the topic; adding to, and expanding on the data elements suggested by the focus group and then reducing these data elements into a manageable dataset (Boutron et al., 2005; Polit and Beck, 2006). Collective expert opinion was also obtained on the collection methods for each data element (Brender et al., 2000; Boutron et al., 2005). The outcome of this phase was achieved: determination of a MDS and specific data collection methodology, thus allowing the project to progress to Phase Two – development of the tool to define the EMS patient population.

3.3. Phase Two

3.3.1. Introduction

The data elements developed and refined in Phase One were converted into a data collection tool (patient report form), with user instructions, for pilot testing. The objective of this phase was to develop and refine the tool in preparation for the Phase Three purpose of testing the tool.

3.3.2. Study design

This phase of the study was concerned with refining the data collection and the user instructions. A record review was conducted to assess the form for completeness. Semi-structured, interpretively active, conversational style interviews were then used to discover the reasons for incompleteness and to discuss changes recommended by the participants. An interview is interpretatively active when the researcher acknowledges that an interviewee is not simply a pool where knowledge can be obtained, but rather that knowledge is constructed with the participants and that

collaboration will increase the depth of data collected from an interview (Holstein and Gubrium, 1997). The aim was to obtain professional opinion and not to discover personal opinion and emotion. Thus the principles of qualitative interviewing would be followed, with the exception of “searching for meaning” within the participants body language and word choice (Rubin and Rubin, 1995).

3.3.3. Study setting

The DEMCR paramedic rapid response vehicle (Techmed 1) was the setting for this phase. This vehicle is used for work integrated learning (WIL) and operational duties as part of an affiliation between the DUT and KZN EMRS. It is crewed by the DEMCR staff, all of whom are advanced life support practitioners (ECP-A), and paramedic students in their second and third year of studies. The vehicle is operational for two to four shifts per week.

Staff and students have wide and varied experience with EMS services, and thus with collecting patient data. The staff members have all been operational ECP’s in various private and public services. All second and third year students have had at least one year of field experience due to WIL, while most of them have worked or currently work for private services on a part-time basis. Therefore, it is believed that this setting is appropriate to this phase.

3.3.4. Population

The staff (6 potential) and students of DEMCR (51 potential) involved in work integrated learning (WIL) and the patient records they completed form the population for this phase. This accounted for all the second and third year students, and all the staff members of the department. The patient records were the form developed in Phase One.

3.3.5. Sampling strategy

A purposive sampling strategy was used, specifically typical case sampling, to ensure that typical EMS case data was captured. The researcher chose a six week period near the beginning of the academic year (9 February and 16 March 2007). Sampling bias was avoided as the rostering of staff and students occurred

independently from this study and before the dates of this phase were announced (Polit and Beck, 2006).

Eighteen people participated in this phase of the study; an adequate number, according to Polit and Beck (2006), to reach saturation in a qualitative approach. Table 3.3 shows the list of participants and the number of forms they completed. This table only indicates the participant whose name appeared on the form and not all participants who contributed to the completion of the form. In the researcher's experience as a lecturer he has found that the students tend to be collaborative in both patient management and in documenting the cases; this appeared to be occur frequently in this research.

Table 3.3: Participants involved in the initial tool testing

Participants	Staff	Student	Number of forms						TOTAL
			V1	V2	V3	V4	V5	V6	
1		√			1				**1**
2		√			1				**1**
3		√			1			7	**8**
4		√				1			**1**
5		√			1				**1**
6		√				1			**1**
7	√				1				**1**
8		√				1			**1**
9		√				1			**1**
10	√			1					**1**
11		√				2			**2**
12		√				1			**1**
13		√					1		**1**
14	√		2						**2**
15		√			1				**1**
16		√					1		**1**
17		√				2			**2**
18		√			2				**2**
TOTAL			**2**	**1**	**8**	**9**	**2**	**7**	**29**

3.3.6. Data collection tool and methods

Data collection involved two methods – a record review (of each completed MDS collection tool) and semi-structured interviews with the participants. Thus the methodology included the development of the tool, the review of the completed tool and the interview guide.

3.3.6.1. Development and implementation of the data collection tool

A form was developed on MS Excel (Microsoft) using the MDS developed during Phase One of the study and accepted guidelines for form development (section 2.7.2). A set of accompanying user instructions were developed to guide the participants in the completion of the form. The form comprised of tick boxes, alphanumerical code boxes and free text space. As discussed in section 2.7.2 form design is technically challenging, thus particular technical requirements for layout were only considered insofar as to make the form logical to complete and not necessarily the best possible design for the form (Jarrett, 2000b; Jarrett, 2005b). As the form was completed by volunteer participants who had been briefed on the purpose of the research it was thought that they would attempt completeness in capturing the data (Hutchinson, 1989, Wilson, 1989). Furthermore the purpose of this phase of the study was to ensure that the data collection requirements and user instructions were understood by the participants. The actual layout of the form was not the primary focus; however it is important to note that the quality of completion is related to the form design (Marco, Buchman and Lancz, 2003; Paulos, 2005, Polit and Beck, 2006).

3.3.6.2. Implementation of data collection tool and record review

Over a period of six weeks (9 February and 16 March 2007) the staff and students were asked to complete the tool for all the patients they manage. During this time they were to identify problems with the forms; e.g. form layout, missing data fields, unobtainable data, lack of clarity of instructions and any other concerns that may have arisen.

Some forms were completed by the lecturers and others by the students. Students and lecturers also assisted each other in completion of the forms, so that often it was filled in “by committee”. The participants were only told of the purpose of the research but not given any explanation on how to complete the form (until the sixth version) apart from the written user instructions. The reasoning behind not explaining the form’s completion in depth was to test if the user instructions and form were sufficiently clear.

3.3.6.3. Participant interviews

As discussed in section 3.3.2, semi-structured, interpretively active, conversational style interviews between the researcher and the participants were held to determine difficulties with completing the forms. The interviews were semi-structured (Holstein and Gubrium, 1997), with the researcher asking particular questions.

- Why certain fields on the form were completed, not completed or completed incorrectly (questions based on each form specifically);
- What difficulties the participant encountered in completing the form and following the user instructions; and
- What changes the participant would recommend, and why.

Second, the interviews were interpretively active (Holstein and Gubrium, 1997).

- Questions emerged from (i) the completeness and accuracy (or lack thereof) of the form; and (ii) the discussion, as it progressed.
- Collaboration took place between the researcher and participant(s) to make the form and user instructions more relevant, useable and understandable.

Thirdly the interviews were conversations (Rubin and Rubin, 1995) which attempted to focus specifically on the problem areas of the form and user instruction. During interviews the participants received more instruction, where required, on the correct completion of the form and the correct interpretation of the user instructions; thus improving how the subsequent forms were completed.

3.3.7. Data analysis and interpretation

The interviews were not recorded for transcription and later analysis; rather notes were taken on the completed forms and analysis performed immediately with the participation of the interviewee, thus actively interviewing and creating synergy in the development of ideas (Holstein and Gubrium, 1997). Following this analysis the tool and user instructions were refined accordingly (see section 4.3.1). All interviews were conducted between one hour and seven days following completion of the forms; as appropriate for this type of research (Rubin and Rubin, 1995).

3.3.8. Trustworthiness

The researcher made changes (to the tool and user instructions) as deemed necessary. The altered forms and user instructions were then used and again

commented on until, in version 6, there were no more comments on problems and / or recommended changes. The completed forms were scanned and the researcher's notes placed on the image; these are available for scrutiny on request.

The choice of study setting was an academic department, where the staff and students may be more participatory in research activities, thus may not be reflective of the EMS industry, and therefore have limited transferability. However, as discussed in 3.3.3, the participants are believed to have the necessary experience for this phase. Furthermore the researcher was a staff member and this may have influenced participation positively. Following the record reviews and interviews the researcher is of the opinion that these factors may have increased participation, but they did not necessarily affect the dependability and transferability.

3.3.9. Ethical issues

Staff members and students were verbally informed of the purpose of study and their rights as participants and were requested to complete an informed consent form (Appendix D) were given to all participants. No patient names were recorded on the PRF, thus making the patient data anonymous to the researcher. All comments received were stored securely, as with other written or transcribed verbal data, in a secure archive.

The researcher is a staff member at DEMCR and has taught all of the students involved in the study at some point during their education on the paramedic programme. Nevertheless the researcher was careful not to coerce anyone into participation and is satisfied that the relationship between researcher and participant (student or staff member) is such that refusal to participate in, or withdrawal from, the study could be done easily, as discussed above. This was the case when three forms were completed but the students who completed them appeared to not want to participate in this project by being interviewed. In accordance with the conditions agreed to in the consent form and because of nature of the relationship between the researcher and participants, this issue was not pursued and the forms were not considered during the study.

3.3.10. Limitations

Detailed form design is a very technically demanding task (section 2.7.2) and beyond the scope of this research project. Some attention was given to aspects of the form design in accordance with the literature, for example using tick boxes, requiring short answers and the position of the items (Jarrett, 2000b; Marco et al., 2003). However, it is possible that other aspects were overlooked and may well have had an impact on the completion of the tool and the participants' opinions (section 4.3.1).

3.3.11. Conclusion

The tool (PRF) and associated user instructions developed from the MDS and refined in this phase were used to guide the development of the tool for testing in Phase Three.

3.4. Phase Three

3.4.1. Introduction

The MDS was developed in Phase One and led to Phase Two where a data collection tool and user instructions were developed. Pilot testing was then used to refine the tool and user instructions in preparation for field testing in this phase (Phase Three). The interface between Phases Two and Three is the use of the data elements from the final version of Phase Two in the development of the tool to be used in Phase Three. This tool was designed in collaboration between the researcher and a commercial form design and automatic data collection organisation (Galdon Data).

The determination of the accuracy of the data collected was beyond the scope of this project. Data contained on the patient report forms will be taken at face value. Checking accuracy would have required on scene validation of patient characteristics against data recorded, which raises ethical issues and resource constraints. Ultimately accuracy of data collection is a clinical governance issue and not a methodological process. This phase of the research is looking at the opinions of the intended users on how they experienced the use of the form, the ease of data collection and the perceived appropriateness (face validity) of the tool.

3.4.2. Study design

This phase of the study consisted of both a qualitative approach and a quantitative approach. The qualitative aspect involved semi-structured interviews with the participants to elicit opinions on the tool and instructions for users, and discussed problems, causes and possible solutions involved in collecting the data as required by the tool. Thereafter the quantitative investigation was a record review to test the completeness of data collection by use of the tool. The guiding principle behind this phase was to test if the tool worked in an authentic environment when used by operational ECP's.

3.4.3. Study setting

The researcher elected to use the KZN Emergency Medical Rescue Services (EMRS) as the study setting. KZN EMRS is the provincial Department of Health EMS operating a tiered response system for the 11 health districts and includes an aeromedical service. KZN EMRS was chosen as it was convenient to the researcher's location and collaboration had already been established through cooperative education, continuing professional development and operational assistance. The researcher was previously a member of the senior management of this service and was aware that the service wanted to redevelop their patient report forms.

In a meeting (9 January 2006) to discuss this research project, the executive committee of KZN EMRS requested that the tool be tested in both urban and rural areas. The reasoning behind this request was both practical and political: (i) the current assumption (section 2.6) suggests that different patient types are found in urban versus rural areas; and (ii) it was a practice in the past to test new ideas in the urban areas and then implement across the province without further testing for suitability or effectiveness in the rural areas. KZN is a predominantly rural province with pockets of urbanisation (Havemann and Kearney, 2006).

3.4.4. Population

The target population for the qualitative aspect of this phase was all emergency care practitioners (ECP's) in South African prehospital EMS. The accessible population though, based on the study setting, was the ECP's in KZN EMRS.

The population for the quantitative part was all forms completed by the participants in the qualitative part of Phase Three.

3.4.5. Sampling strategy

3.4.5.1. Qualitative section

A multi stage sampling plan was used for the qualitative side:

i. Two districts of the KZN EMRS were chosen as the urban and rural test sites, respectively, by means of purposive sampling. Their location is convenient to the researcher and they meet the criteria of urban and rural areas.

ii. The second stage of the sampling process was also purposive sampling. Only ECP-Advanced (ECP-A) providers were considered eligible.
    a. They are the senior medical personnel on scene and the researcher was of the opinion that a person who is able to complete one of the two educational routes to becoming an ECP-A, must be of sufficient intellect to comment on the use of the tool being studied;
    b. The ECP-A's tend to fewer patients and have more free time on a shift than the ambulance crews, thus allowing them more time to complete the tool.

iii. The last stage in the sampling process was a purposive sampling of the ECP-A's in the two districts. Attempts were made to meet with all the operational ECP-A's in both districts to request for volunteers. Table 3.4 shows the potential number of participants (Total ECP-A's) and those that volunteered to participate (Participants). The two participants who partially completed the trial both moved from public sector to private sector EMS during the study period and requested exclusion from the remainder of the study; both had completed some forms and had been interviewed during the study period (discussed below). The two participants that did not complete any part of the trial both claimed the time was a serious challenge (section 5.2.1). Thus seven participants completed this phase and two partially completed this phase. Whilst this is a small number, qualitative studies typically have small samples (Polit and Beck, 2006).

Table 3.4: Participants in Phase Three

District	Total ECP-As	Participants	Completed trial	Partially completed trial	Non-completion of trial
Urban	16	7	5	1	1
Rural	6	4	2	1	1
Total	**22**	**11**	**7**	**2**	**2**

3.4.5.2. Quantitative sample

All forms (N=265) completed by the participants were analysed for completeness, no sampling took place. Initially it was expected that 1500 forms would be completed over a two month period; this is based on 10 ECP-As each working 15 shifts per month and responding to 5 cases per shift. A number of reasons, unforeseen initially by the researcher, resulted in a substantially reduced number of forms been completed:

i. attrition of participants
ii. participants not completing forms if they were not the practitioner managing the patient (this occurred when the ECP-A arrived on scene to find another paramedic managing the patient, or when the patient was already removed from the incident); and
iii. participants taking leave within the study period.

Nevertheless a substancial number of forms have been completed to test for completeness of data element completion.

3.4.6. Data collection tools and methods

The participants were trained on the use of the form/tool by means of a Power Point® (Microsoft Corporation) presentation; this training took place at the same time that the participants were recruited. Each participant was issued with a supply of forms and a copy of the user instructions. The participants were requested to complete the form for every patient they attended to over a period of two months. The purpose of this phase of the study was to determine the users' opinion and completeness of data collection when using the tool. Therefore two methods of data collection have been used: participant interviews and record reviews.

3.4.6.1. Participant interviews

The researcher met with all participants, on an individual basis, at least once during and again at the end of the research period. Individual interviews were held with the participants at each meeting; recording was done by the researcher making written notes during the interviews. The rationale behind individual interviews as opposed to group interviews was simply practicality: participants did not all start their two month period at the same time, participants were based in different areas throughout the two districts and meeting times and places needed to be structured according to the participants work and personal commitments.

Unstructured interviews were held during the period in which the participants were completing the MDS tool. The researcher posed a broad question enquiring about the participant's experience in the completion of the form. The questions emanated from the participant's responses and a quick scrutiny of the completed forms by the researcher. Additional training in the completion of the tool, where required, was given by the researcher at this time. The final interviews were semi-structured using the following interview guide.

i. *Did you complete these forms for all your patients? If not, why?*
ii. *Are there any data elements that you feel are unnecessary in describing the patient population? What are they?*
iii. *Are there any data elements that you feel are missing in order to describe the patient population accurately? What are they?*
iv. *Are there any data elements that are confusing to you? What are they?*
v. *Are there any data elements that you would prefer to collect in a manner different than on the form? How?*

3.4.6.2. Record review

In collecting data for completeness testing the researcher, using a binary system in an *Excel*® (Microsoft Corporation) spreadsheet, captured whether or not all the fields were completed in participants' forms.

3.4.7. Data analysis and interpretation

3.4.7.1. Qualitative part: participant interviews

Findings from the interviews were analysed for patterns / similarities / consensus and conclusions drawn from these. In the mid-phase interviews clarification on the completion of the form was given as required. This was done to assist in preventing inaccuracies due to participant misunderstandings. Participants handed completed forms to the researcher when they met for the mid-phase interviews. These were then scanned for completeness and an attempt was made to identify causes of incompletion and inaccuracy. After the interview, the forms were carefully checked for completeness as explained in 3.4.6.2. At subsequent interviews, the researcher again questioned participants regarding problems identified with completeness of forms. Thus simultaneous data collection and analysis was occurring (Holstein and Gubrium, 1997; Ulin et al., 2005; Green and Thorogood, 2006). Findings are discussed in section 5.3 and Table 5.2.

3.4.7.2. Quantitative part: statistical analyses of data collection

Descriptive statistical data analyses were conducted in terms of completion of the MDS. Applicability of data elements was considered for each case; e.g. it was required that the estimated age only be completed if the exact age was not collected; thus while the exact age was required on all 265 completed forms, the estimated age was only required in 97 forms (total number of forms less forms with exact age recorded) (section 5.4.1.1). Therefore data elements could be compared with each other based on percentage of completeness and not the number completed.

Groups of data elements were constructed in order to ascertain the completeness of data to actually answer certain questions; e.g. age, race and gender were clustered to answer the question ‘what is the demographic profile of the patient?’ Thus it was possible to determine not only what percentage of each data element was complete, but also the percentage completeness for the descriptors of the patient population.

Related fields were grouped to assess completeness of data. Example 1: At least one of the three age categories (date of birth, exact age and estimated age) were required to describe the patient’s age as a demographic and clinical condition data element. Example 2: age, AVPU, skin temperature assessment, mobility, respiration

rate, pulse rate and systolic blood pressure were all required to prioritise the patient's clinical condition.

The methodology and results of the quantitative analysis are discussed in detail in section 5.4.4, Charts 5-1 to 5.11 and Table 5.3.

3.4.8. Trustworthiness of qualitative aspect

The researcher made notes during the interviews; from the notes summaries were made which were then discussed in the findings (section 5.3 and Table 5.2). The raw data is available for scrutiny and member checks were conducted on the summaries.

3.4.9. Reliability and validity of the quantitative part

All the forms completed by the participants were selected, resulting in a large number for analysis. Therefore there was no sample and the findings can be considered representative of the testing with these specific participants.

The validity of the instrument has been addressed in all three phases of this study. In the first phase content validity of the tool was shown by the use of experts in developing the MDS (Polit and Beck, 2006). The tool put together from the MDS was shown to have face validity by requesting comment from the participants in Phases Two and Three on whether or not the tool appears to be collecting data on the patient population (Marco et al., 2003; Polit and Beck, 2006). Finally in this phase (Phase Three) the researcher has demonstrated that the tool has construct validity. Data elements have been grouped together to answer particular questions regarding patient population descriptors (see 3.4.7.2).

The capture of data from the forms and entry onto the database was checked by a research assistant, thereby ensuring accuracy of capture. The evaluation of the completeness by the researcher was checked by the supervisor. The same results were obtained as those of the researcher. This could be regarded as a form of inter-rater reliability.

3.4.10. Ethical issues

Approval was obtained from the KZN Department of Health. No patient names or other personal information was recorded on the form making the data anonymous to the researcher; only the treating practitioner would be aware of whom the patient was, as is usually the case. The patient records and the database have been kept secure at the department and will be disposed of after five years by shredding. All participants were given full information during the presentation and an informed consent form (Appendix D) to complete. The participants were informed of their right to withdraw, at any time, from the study – four exercised this right.

3.4.11. Limitations

This phase only tested the tool within the public sector EMS of the KwaZulu-Natal province. It is acknowledged that it still needs to be tested in both the private and public sectors of all provinces.

3.4.12. Conclusion

Thus the tool was tested and evaluated for completeness and easy of completion. The opinions of the participants should be useful in the effective implementation of a similar tool throughout all of KZN.

CHAPTER FOUR: Findings Phases One and Two

4.1. Introduction

While data collection, analysis and interpretation are theoretically separate activities, in qualitative research (especially grounded theory) they merge in practice. This is especially true in the case of this research project as the researcher developed ideas on analysis and interpretation during data collection; which he then recorded as field notes. One of the advantages of data analysis during data collection according to Rubin and Rubin (1995: 226) is that *"this preliminary analysis tells you how to redesign your questions to focus in on central themes as you continue interviewing"* thus allowing for an improvement in the type or quality of data collected (Patton, 1987, Rubin and Rubin, 1995).

Thus this chapter presents the results and discussion of the results of Phases One and Two, essentially the development of the tool.

4.2. Phase One: Development of the minimum data set

This phase comprised two parts, a focus group discussion followed by a Delphi study. However due to the shared purpose the findings of both parts will be discussed together to avoid undue repetition. All raw data – transcript and summary of FGD, original Delphi questionnaires and participant comments - are available on request.

The focus group was tasked with determining what data is needed to define the population using the EMS. The researcher then expanded on the findings of the focus group by studying relevant literature (Marsden, 1995; Spaite et al., 1995; Brady et al., 1996; Svenson, Spurlock and Calhoun, 1997; Pollock et al., 1998; Svenson, 2000; Phelps et al., 2002; Maybloom and Champion, 2003; Colquhoun, Davis, Harris, Harris and Chamberlain, 2004; Razzak et al., 2004; Haller, Myles, Stoelwinder, Langley, Anderson and McNeil, 2007) and gleaning additional data elements from existing patient report forms (see Appendix A) in use in the South African EMS (both private and public sectors). A list of potential data elements to be used to generate patient population information was extracted. This list together, with the list developed in the FGD formed the basis for the first round of the Delphi study. This combined list of potential data elements for the MDS was placed into

conceptual groupings as developed in the FGD (Table 4.1 and section 4.2.1.1); this is in alignment with the first three of the five steps in analysis of data (section 3.2.2.7): (i) identifying the big ideas; (ii) unitising the data; and (iii) categorising the data (Vaughan et al., 1996).

Table 4.1 shows the development of the MDS starting with the FGD, expanding the findings and completing the four round Delphi study. A general description of the development of the tool is presented first, followed by a discussion of each data element in the table. In some cases, individual elements are presented, while in other cases multiple elements are described.

Table 4.1 Development of MDS from FGD through four rounds of Delphi

FGD	Minimum Data Set Data Element Development Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
		DEMOGRAPHICS			
	Name Identity number Case number				4.2.2.3
Age	Date of birth / age / age group	Age / age group	Included	3-digit box for actual age Tick boxes for categories: • Neonate • Infant • Child • Youth • Adult • Elderly	4.2.2.1
	Residential address	Residential area	Excluded		4.2.2.5
Location	Incident location	Incident location	Included	Boxes for alpha-numerical codes (hand-written) for either sub-districts (for district municipalities) or suburb groupings (metropolitan municipalities)	4.2.2.4
		Location type	Included	Tick-boxes for: • Public roads • Industrial facilities • Health facilities • Commercial facilities • Residence • Agricultural	4.2.2.4
Race	Race	Race	Included	Tick boxes for categories: • Black African • Coloured • Indian / Asian • White Other	4.2.2.2

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
Gender	Gender	Gender	Included	Tick boxes: • Male • Female	4.2.2.3
		Marital status	Excluded		4.2.2.3
Housing type	Type of housing – e.g.: flat, house, informal settlement	Type of housing – e.g.: flat, house, informal settlement	Excluded		4.2.2.5
FINANCIAL					
Medical aid	Medical Aid	Medical Aid	Excluded		4.2.2.6
Employment	Employment details	Employment level / sector details	Excluded		4.2.2.6
	Medical aid authorisation number		Excluded		4.2.2.6
	Credit card details		Excluded		4.2.2.6
	Payment method		Excluded		4.2.2.6
	Postal address		Excluded		4.2.2.6
	Guarantor details		Excluded		4.2.2.6
	Response type: primary, assistance or transfer	Response type: primary, assistance or transfer	Included	Tick boxes for: • Primary response • Request for higher level of assistance • Inter-facility transfer • Additional transport / manpower	Accepted without comment
CLINICAL					
Chief complaint - ICD-10	Chief complaint	Chief complaint	Included	Alpha-numerical coding and boxes for the codes. This list is for further study.	4.2.2.7
Diagnosis - ICD-10	Provisional diagnosis – "EMS condition" versus ICD-10 coding	Provisional diagnosis – "EMS condition" versus ICD-10 coding	Included	Alpha-numerical coding and boxes for the codes. This list is for further study.	4.2.2.7
		ICD-10 code for diagnosis	Excluded		4.2.2.7

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
Priority / triage	Patient priority – priority 1,2,3,4 / red, yellow, green, blue	Patient priority – priority 1,2,3,4 / red, yellow, green, blue	Excluded		4.2.2.8
Interventions - performed	Procedures done / interventions performed	Procedures done / interventions performed	Excluded		4.2.2.9
Interventions - attempted	Interventions attempted	Interventions attempted	Excluded		4.2.2.9
	Defibrillation and other electrical therapy	Defibrillation and other electrical therapy	Excluded		4.2.2.9
	Intravenous infusions: fluid type, site; volume; time of set up	Intravenous infusions: fluid type, site; volume; time of set up	Excluded		4.2.2.9
	Medications administered: type; route; dosage; time administered	Medications administered: type; route; dosage; time administered	Excluded		4.2.2.9
Findings on scene	Findings on scene	Findings on scene	Excluded		4.2.2.11
	Primary and secondary survey findings	Primary and secondary survey findings	Excluded		4.2.2.11
	Loading factors	Loading factors	Excluded		4.2.2.11
	Skin condition	Skin condition	Excluded		4.2.2.11
	Bleeding	Bleeding	Excluded		4.2.2.11
	Neurological defect	Neurological defect	Excluded		4.2.2.11
	Estimated fluid loss	Estimated fluid loss	Excluded		4.2.2.11
	Burns estimation	Burns estimation	Included	2 digit boxes for numerical recording	4.2.2.11
Mechanism of injury	Mechanism of injury	Mechanism of injury	Included	Boxes for alpha-numerical code – according to a list to be generated	4.2.2.10
	Detailed mechanism of injury	Detailed mechanism of injury	Excluded		4.2.2.10
	Incident type	Incident type	Included	Boxes for alpha-numerical code – according to a list to be generated	4.2.2.10

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note

Vital signs	Vital signs:
	• GCS
	• pupil size and reaction
	• respiration rate, rhythm and depth;
	• SpO2
	• air entry
	• EtCO2
	• BP
	• pulse rate, rhythm and strength
	• ECG
	• HGT
	• capillary refill
	• APGAR
	• trauma score
		Vital signs:
		• GCS
		• pupil size and reaction
		• respiration rate, rhythm and depth;
		• SpO2
		• air entry
		• EtCO2
		• BP
		• pulse rate, rhythm and strength
		• ECG
		• HGT
		• capillary refill
		• APGAR
		• trauma score
		• temperature
			Included	Boxes for recording:•
				• RR – numerical 3 digit
				• HR – numerical 3 digit
				• SBP – numerical 3 digit
				• Temperature:
				  ○ numerical 3 digit (2 + decimal) for recorded temperature
				  ○ Tick boxes for tactile estimation:
				  ▪ Normal
				  ▪ Hot
				  ▪ Cold
				• HGT - numerical 3 digit (2 + decimal)
				• AVPU – tick boxes for:
				  ○ Alert
				  ○ Responding to voice
				  ○ Responding to pain
				  ○ Unresponsive
					4.2.2.8.1

Interhospital transfers - ventilator settings	Settings of ventilators and infusions	Settings of ventilators and infusions	Excluded		4.2.2.11
		Medic Alert present or not	Excluded		4.2.2.11
		Altitude and cabin pressure	Excluded		4.2.2.11
		extrication, immobilisation, KED, Long/spinal board, scoop, neck collar, traction splint, MAST, board splint, MILS,	Excluded		4.2.2.11

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
		Breathing: • Spontaneously • ventilated - manual/mechanical, • tracheal intubation - orotracheal / nasotracheal / cricothyroidotomy / Jet insufflation	Excluded		4.2.2.11
		Tubes: • nasogastric tube • orogastric tube • urinary catheter • enterostomy tubes • feeding tubes - etc	Excluded		4.2.2.11
		Oxygenation: • FiO2 • type of mask • flow rate of O2 • SpO2	Excluded		4.2.2.11
MEDICAL HISTORY					
Current meds	Medications	Medications	Excluded		4.2.2.12
	Medical history	Medical history	Included	Tick-boxes for • Cardiac disease • Chronic lung disease • Asthma • Diabetes • TB • HIV • Hypertension • Current pregnancy • Cancer • Paralysis	4.2.2.12
	Present history	Present history	Excluded		4.2.2.12

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
Events preceding illness / injury	Events preceding illness	Events preceding	Excluded		4.2.2.12
Recent travel history, nationality or place of residence	Recent travel history	Recent travel	Excluded		4.2.2.12
TIMES & DISTANCES					
Fleet / registration no of vehicle	Vehicle identification: fleet / registration numbers				4.2.2.15
Times to / from scene and hospital	Times of case: • Response • guide picked-up • on scene • departed • hospital informed • destination • refuelling • available,	Times of case: • Response • guide picked-up • on scene • departed • hospital informed • destination • refuelling • available	Included	4-digit boxes for each of the following: • Time mobile • Time on scene • Time at patient's side • Time left scene • Time at hospital	4.2.2.13
Distances to / from scene and hospital	Mileage of case: • Response • Scene • Destination • available	Mileage of case: • Response • Scene • Destination • available	Included	6-digit boxes for odometer reading: • Start of response • On scene • At hospital / drop of point	4.2.2.13
	Receiving hospital	Receiving hospital	Included	Boxes for alpha-numerical codes (hand-written).	4.2.2.4

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
PERSONNEL / LEVEL OF CARE					
HPCSA No.	HPCSA and staff numbers				4.2.2.14
Name	Crew names				4.2.2.14
	Crew signature				4.2.2.14
Qualification level	Level of health care provider	Level of health care provider	Excluded		4.2.2.14
Request for assistance	Assistance required from other EMS crew	Assistance required from other EMS crew	Included	Tick boxes for assistance required: • Aeromedical services • Medical practitioner (doctor) • Rescue • Telephonic advice • Other	4.2.2.14
		Request for higher level of care	Excluded		4.2.2.14
Level of care provided – based on procedures performed rather than staff present	Level of care provided – based on procedures performed rather than staff present	Level of care provided – based on procedures performed rather than staff present	Included	Excluded	4.2.2.14

FGD	Delphi 1	Delphi 2	Delphi 3	Delphi 4	Note
ADMINISTRATIVE					
Check block for admin officer / clinical supervisor	Supervisor signature				4.2.2.15
Patient's signature	Patient or guardian signature				4.2.2.15
Notifyable conditions		Infectious / notifiable disease box for patients with fever - meningitis, measles, chickenpox etc and whether crew took prophylaxis or not	Excluded		4.2.2.15
Handover signature	Handover signature				4.2.2.15
	Valuables				4.2.2.15
	Refusal of transport / treatment clause and signature				4.2.2.15
	Name of person informed of ambulance on route				4.2.2.15
	Location of guide				4.2.2.15
	Control centre data: caller's name, telephone number and time of request				4.2.2.15
	Equipment / stock used	Equipment / stock used	Excluded		4.2.2.15

4.2.1. General description of MDS development

4.2.1.1. Focus group discussion

The focus group of seven EMS experts discussed and agreed on 31 data elements that would assist with the definition of the patient population. These elements are presented in Table 4.1 and were used as the basis for the first Delphi round.

The participants agreed that data should answer questions about the following broad categories of the patient population: “medical / patient care”, “demographics”, “times and distances”, personnel details / level of care” and “medical history”. Following the analysis of the FGD and Delphi study the researcher grouped the data elements under the headings shown in Table 4.1. No further grouping of data elements was conducted until Phase Three (5.4.4).

4.2.1.2. Delphi – Round One

6 out of 18 panellists (33%) (section 3.2.3.6.1) responded to this round. All panellists added meaningful comment; however Panellist 18 gave valuable insight into the project:

“The task you are busy with is (I’m sure you have realised) very complicated. ‘Design a PRF’ sounds really easy, but it isn’t. Not to design a useful one anyway. I’ve been exposed to this on a smallish scale with the whole … thing which goes back more than seven years now. If your intention is to produce a really meaningful instrument, which lends itself to electronic implementation, you have to think very, very clearly not just about the dataset, but about exactly how you will implement and use it. Although an electronic database may be something you see happening at a later stage you need to design the dataset for it now.

“One of the most important things which hasn’t been addressed yet is the nature of data types for each item. It’s easy to say you will record a history, but how exactly will you do this? Will you allow free text descriptions? If so will you want the same thing in an electronic database? There are pros and cons, but allowing people to write narratives, store this in a database and then try and extract meaningful information from it is very difficult. A simple idea like “incident type” actually is a major headache to implement. What and how many incident types are there and will

everyone agree on what they are? What if someone wants to add an incident type which, after release of the final PRF version, you realise was overlooked? Can people make up their own definitions for incidents?

"I think the best approach you could adopt is to require an unequivocal justification for every item in your proposed dataset (why this thing is crucial in describing the population you want to describe and for the adequate functioning of the EMS where it is used). Otherwise chuck it"

This comment led the researcher to re-examine the aims of the Delphi study. As a result of the last paragraph of the quote *"... require [a]... justification for every item in your proposed dataset (why this [data element] is crucial in describing the population...)"* he realised that the scope of the project had been exceeded. The title of the project had always been clear: Development of a tool to define the population of emergency medical service users in South Africa. However during the course of defining the study the purpose had been expanded to include having the tool meet the clinical, legal, financial and administrative requirements of the particular EMS, in other words, creating a composite PRF as opposed to developing one part of a PRF. This was obviously not practical as different EMS systems have different data requirements based on (amongst others):

i. scope of operations - some provide only interhospital transfers, others only events coverage;
ii. method of PRF completion - electronic or paper;
iii. funding and revenue;
iv. level of care provided - ALS only service, BLS only service, medical practitioner service, etc; and
v. target population - closed groups (e.g. mines) or general public.

Thus the researcher realised that it was necessary to reduce the scope of the Delphi study and focus only on the data elements required to describe the patient population and exclude all other data elements, despite them being relevant to a complete PRF.

Thus to develop a complete PRF to meet all the data requirements of all the EMS providers in South Africa would produce a cumbersome form with a large number of

redundant data fields, as the various providers have different information needs. The development of an MDS to provide a description of an EMS user only is congruent with the original purpose and rationale for the study; and as said by Panellist 18: "*an unequivocal justification [is required] for every item in your proposed dataset"*. Therefore, the focus of the questions was adjusted in order to produce a patient population dataset. (Additional detail is provided in 3.2.3.6.2.) Analysing data and adjusting the Delphi study between rounds is an acceptable practice as shown by Verhagen, et al (1998). The researcher conducted the analysis, performed any changes as required and justified his decisions. This procedure was followed through all Delphi rounds.

Figure 4.1 illustrates how a hypothetical group of datasets could be combined to form a composite PRF. Initially the scope of this research was to develop only the patient population dataset, however as discussed above, it expanded into developing an entire PRF. Following the analysis of Delphi Round One the researcher was able to pictorially place the aim of this research (developing a patient population dataset) into perspective with a PRF. As is indicated, the data elements on the PRF may be used only for one data set or they may be used across multiple data sets (e.g. a patient's medical insurance details may only be required for billing data whereas the response time to a patient may be required by the patient population, billing and management data sets). Datasets could reasonably be expected to be different based on the requirements of the service concerned; e.g. a closed user EMS service may not require a billing data set, the clinical data set of a BLS only service would contain different fields to an ALS service, etc

Thus Round One of the Delphi study not only provided expert opinion on the MDS but also assisted in guiding the entire project.

.

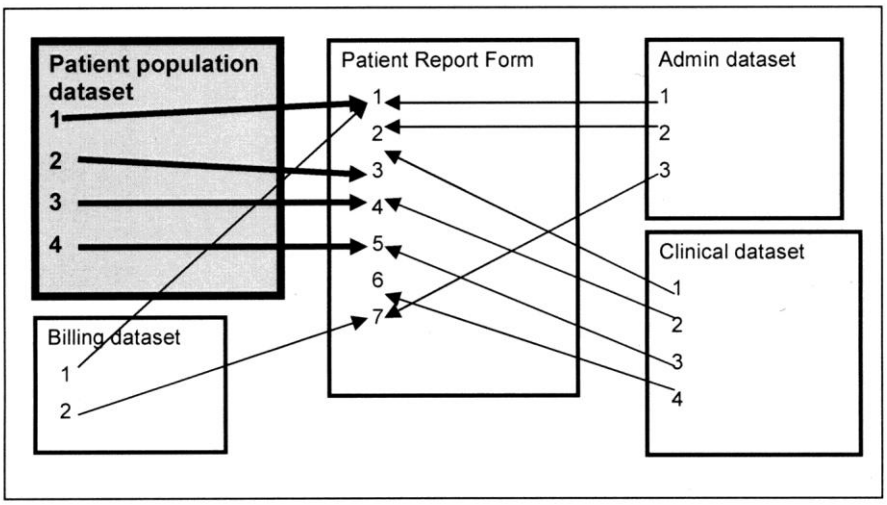


Figure 4.1 Group of data sets combining to form a composite PRF

4.2.1.3. Delphi – Round Two

This round had a 78% (12/18) response. Concern was expressed, by a number of panellists, that there were too many data elements. Further, it was evident that some panellists were confused by the change from developing a complete PRF to only developing a patient population data set.

This analysis of this round was based on this observation: *"I think you should better demarcate the boundaries of the project now that it has been modified. You have asked for stuff enabling us to describe our patient population. Everything that is in here does that, but it would be worthwhile to further refine the parameters. I guess you are interested in the macro level – chief complaint, provisional diagnosis, response data, locations of incidents, triage, level of care provided, etc. I think it would be difficult to explore patients based on vital sign parameters, interventions, drugs etc."*

This comment from Panellist 5 justifies the decision taken as a result of the analysis of Round One: *"I would however like to make a suggestion. What about dividing the report into sections containing key pieces of information based on the prioritisation [P, where 1 is high and 3 is low priority] of the patient? I.e. for a P3 you only complete section one, for a P2 section one becomes compulsory and for P1 section 3 becomes compulsory while section 4 can be used for certification of death where applicable."* Although Panellist 5 is referring to specific information needs for specific

patient types he is illustrating the point discussed in section 4.2.1.2, that data needs are different and while it should be possible to develop some common datasets it is not feasible to develop a common PRF.

Following an analysis of the expert opinions regarding each data element, the elements were placed into one of two categories - to be included or excluded from the MDS. The justification for this and a proposed method of data collection (i.e. the codes to describe each data element) was also given. The justifications and collection methods were based on the panellists' comments and a search for best practices reflected in the relevant literature.

4.2.1.4. Delphi – Round Three

A total of 10 (56%) panellists responded to this round. In this round the participants were requested to consider the inclusion and exclusion of data elements for the MDS and comment on the data collection methodologies. Comments on the categorisation of the elements and the collection methods were received on 12 of 17 included data elements. Disagreement with the categorisation was noted on nine data elements (two included and seven excluded). The comments on the data elements were analysed and included into the last round. The disagreements were carefully considered and their exclusion or inclusion was justified. These justifications are given in the instructions to Round Four (Appendix E).

4.2.1.5. Delphi – Round Four

The final round of the Delphi yielded only four responses (22%). This is not surprising as Ferguson et al. (2005) and Keeney et al. (2001) have reported that panel member drop-out is well known in Delphi studies and poor response is a characterisation of the final round (section 3.2.3.5). However, this does not necessarily mean panellists were no longer interested, but rather that they had nothing further to add and were following the instruction given: "if you have any opinion or insight regarding this dataset, please submit your comment."

All four of the panellists were satisfied with the progress made to this stage; one required a point of clarification, while another had comment on the data collection of four of the data elements. Thus consensus, being a *"general agreement of a*

substantial majority" (Verhagen et al., 1998: 1236), was achieved and reasons for differing expert opinions clarified (Slaughter, Katz and Grasso, 1999).

4.2.2. Analysis of specific potential data elements

As expected the experts in the Delphi study had differing levels of experience in EMS research and operational activities (section 3.2.3.5). Miro et al. (2007) suggest that it is reasonable to weight experts comments based on their experience, thus having comments from persons with greater experience exerting a greater influence on the report of each round. This, however, was not necessary because more comments on more data elements were given by experts who had greater experience. This is evidenced by the comments quoted in the sections below. Thus the results from this Delphi study are based on non-weighted response.

4.2.2.1. Age

The participants of the FGD agreed that the ages of EMS patients is an important characteristic that should be known. They recommended that codes be used that would allow patients to be collated into age groups, but emphasised that the groupings be aligned to other health research: *"[I] agree with age groups, but 1 – 10 is meaningless; an important national statistic is <5 mortality. You may want to go up to 5 years, then to 10; the specific age grouping is important to capture National Health Plan requirements" (FGD Participant 5)*. There is however a problem with using age groupings in that a uniform system is not used by all researchers. While international health research tends to use 18 5-year bands (open ended over 85 years) for burden of disease (WHO, 2007); this is not true for KZN DOH which uses 9 age bands of either 5 or 10 years (open ended over 65 years) (Epidemiology Unit, 2006). To further complicate matters Statistics South Africa (Stats SA) uses six age bands of various ranges (StatsSA, 2007).

Thus the advice of Delphi Panellist 18 (Round Three), who articulated opinion similar to those of other participants, was followed: *"… there really is no need to take up space and burden the person capturing the data with placing the patients' age into bands. All the capturer has to do is record the age, if it is known … where the exact age of the patient is not known … you need broad categories … So, in summary, have both – a three-digit field for actual age and four-category selection for cases*

where the age is not known." Since this research is conducted in, and for, South African EMS the Stats SA broad categories will be used for cases when the exact age is unknown. This categorisation has been chosen because (i) Stats SA is the official, and presumably largest, collector of population data in the country; and (ii) the age groupings appear logical and clear. It is necessary to add in a category for neonates as the StatsSA does not have this. It is important to note that the preferred method of collecting age data is to use the exact age as it allows for a greater number of statistical tests.

4.2.2.2. Race

Sensitivity still appears to surround the use of race as a demographic descriptor; nevertheless it remains an important descriptor for both disease profiling and for ensuring equitable health service delivery (StatsSA, 2007, WHO, 2007). During the FGD Participant 6 mentioned "ethnicity" and the researcher wrote "race" on the white board. The auditor picked up on this and engaged Participant 6 in discussion. The participant confirmed that "race" was meant.

This concern about racism entered the Delphi study: *"Black, white, coloured, Indian, asian-caucasian, afroafrican, caucasioafrican, foreign; where do we start, what do we use so as not to go back to a racial mentality – I think we should drop RACE as it has no bearing on anything anymore. Socioeconomic criteria are based on income, education, address, qualification, not race. Only relevant demographic information is resident vs. foreign which is not critical. So let's drop it."* (Panellist 8, Rounds One and Two). This sentiment seemed to be shared by a number of the participants; however, while expressing their concern they did concur that it is a useful indicator to *"assess the quality of the services being accessed / delivered"* (Panellist 15, Round Two) given South Africa's history of race determined inequalities in service delivery (HST, 2007) and *"… assess epidemiology of different disease processes and how these differ between the race groups."* (Panellist 18, Round Three)

The researcher discussed this issue with researchers at academic institutions and the KZN DOH and is of the same opinion as that shared by some of the participants – although it may be controversial its importance in clinical research and equitable service delivery cannot be ignored. StatsSA terms have been used to describe the

race groups in this MDS (StatsSA, 2007). In the United States the National Institutes of Health require that clinical research is adequately representative of diverse ethnic groups in study samples in order to examine epidemiological characteristics, diverse diagnostic tests and differential effects of various therapies (Burneo and Martin, 2004).

4.2.2.3. Other demographic and personal data

Marital status was entered into the discussion by a panellist in Round One of the Delphi study. While there was some agreement among participants that this data element could provide some interesting, and possibly useful, data it was not really relevant. The researcher notes that it requires extraordinary questioning (questioning of the patient not directly related to their health) of the patients to determine personal details of their lives not directly related to the management of their current condition, so it was excluded.

Case numbers, and patient names and identity numbers are only useful in identifying the patient and have no population descriptor properties; and as such have been removed from the MDS (as a descriptor of the patient population) but are still to be included in the tool for identification purposes.

Gender, as a descriptor, was proposed, without comment, in the FGD and attracted only one comment: Panellist 15 suggested (in round two) that *“unknown”* be included, apart from just male and female. Other Delphi participants thought that this was unnecessary, an opinion initially shared by the researcher until Phase Two (Table 4.2)

4.2.2.4. Location and destination

The general location of the patient was an element of discussion by the focus group of experts.

Participant 2:	*"Location"*
Facilitator:	*"What specifically do you want from location?"*
Participant 2:	*"Something common to a specific area may indicate a specific problem in a specific area"*
Participant 3:	*"[You] need to determine how you would annotate it. Local municipality or municipal wards; if it is electronic PRF then ward, but for paper based local municipality would be simpler."*
Participant 6:	*"Determine local vs. rural"*
Participant 5:	*"Go as low as possible; local municipalities are better than districts as some districts contain both urban and rural conditions. It is important to get a feel of urban and rural."*
Participant 2:	*"Ethekwini has to operate within the DHIS from 1st April. Currently Ethekwini captures calls according to EMRS zones and not according to the local municipalities."*
Participant 7:	*"Calls should be classified according to ambulance bases. This is better for billing, profitability and to determine what is coming out of these areas."*
Facilitator:	*"What would be the best?"*
Participant 7:	*"Bases would be better for data capture and would be at a much lower level."*
Participant 6:	*"Depends on what we want to capture"*
Participant 3:	*"We want to analyse disease profile, and work with the DHS. Therefore we need to work with sub-districts (KZ's) or local municipalities"*

Excerpt 4.1: FGD regarding general location

The group also decided that the most important data that could be obtained from location was not socio-economic status or ambulance resource allocation, but rather the disease profile.

The Delphi study panellists were concerned with the quality of the data to be collected if the operational EMS staff are to be determining their location in terms of sub-districts or local municipalities. Thus while it was agreed that this data needs to be recorded no consensus was reached on how to record it. Panellist 15 (Round Two) suggested the ideal: *"… it would be good to have a GPS coordinate, but this is unlikely to be practical."* This is practical; the researcher has since had a number of informal (unrecorded) conversations with personnel in the control rooms of public and private EMS and found that there is an increase in the use of tracking systems, and that these systems can be used to record grid references of vehicles. This data can be correlated with time on scene and exact location determined; this was, however, outside the scope of this project (section 6.2)

In the panellists' comments on the first round of the Delphi study was the suggested inclusion of types of locations. This would allow the ECP to indicate the type of location; e.g.: clinic, residence, industrial setting, or road. There was mixed opinion

to the relevance of this, but overall agreement that if it is to be used a short, simplified list be developed. A list of six codes was approved in Round Four.

The response of two panellists in the first round, when commenting on “receiving hospital” was to suggest the inclusion of alternative destinations, specifically clinics; this will certainly give us insight into the seriousness of the patient’s condition as there are criteria for transporting a patient to a clinic instead of to hospital, thus “receiving hospital” was changed to “destination”.

4.2.2.5. Housing type

Focus group participants were of the opinion that this description would give valuable socio-economic information and may assist with disease profiling; e.g. certain diseases may be more common in informal dwellings. However, the Delphi panellists were almost unanimous in rejecting this data element. The reasons for discarding this descriptor vary from overstepping the project’s scope: *“I know you’re trying to describe a population, but if you include this then there are many other things that need to be included as socio-economic markers (personally, I think that is beyond the scope of this dataset).”* (Panellist 18, Round One); to a difficulty in defining accurately: *“There are too many permutations of residing, working, visiting etc. What if they are in a public place and not a house?”* (Panellist 15, Round Two).

The panellist who held the opinion that this element should stay appeared to be of the opinion that it was describing the location of the patient when accessing the EMS: *“This set of information gives a good indication operationally of probable response times to the patient’s side, type of road surface, possible hazards/hurdles, and probable population demographics…”* (Panellist 8, Round 2); thus validating the concern about defining this term accurately.

The patient’s residential address or area, suggested in the FGD, has been removed based on the similar reasons (as discussed above) of incident location versus residence and scope of the project. Instead, the location of the incident will be captured as discussed in section 4.2.2.4.

4.2.2.6. Financial

Although socio-economic data, including medical insurance and employment details, were considered by the focus group participants to be important in describing the patient population, the relevance and ethics this were questioned in the Delphi study: *"I don't see the relevance in terms of describing patient population, except perhaps to understand the proportion of patients with and without medical aid – I am sure that this can be obtained through other sources however. … I also feel there are ethical issues here. If this information is not required in order to treat the patient, is it acceptable to potentially embarrass someone by asking them?"* (Panellist 15, Round Two)

While this information is not required to treat a patient it is required when considering which hospital a patient should go to. Further it is important for billing and accounting purposes. However this need not be considered during this project as financial data will be represented in financial or management data sets.

4.2.2.7. Chief complaint and diagnosis

The chief complaint is the main reason that the EMS is called for or by the patient, whereas the diagnosis is made by the EMS crew. The experts in the focus group were of the opinion that the chief complaint and the diagnosis should be recorded using ICD-10 codes as these are used for billing purposes and diagnostic standardisation and there would possibly be better integration with new control centre software. The panellists in the Delphi study, however, had a different opinion; they considered ICD-10 codes unsuitable and questioned the accuracy and relevance of a prehospital diagnosis:

"The ICD-10 codes are, in my opinion, completely unsuitable for this kind of dataset. How often do we really reach a definitive diagnosis? How often is that diagnosis really correct? How will the person filling in the form ever get to grips with and navigate the huge number of codes? I think the place for a diagnosis to be recorded is the place that is best-suited to make a definitive diagnosis – hospital." (Panellist 18, Round One)

"ICD needs to be rejected outright - far too complex and as such will yield questionable data. The EMS condition is the way to go, but categorising it is where

the challenge is. My experience showed that there was a natural tendency not to commit to a diagnosis, regardless of whether it was labelled provisional or not. … we offered two levels of diagnostic accuracy: common complaints … and a range of system-based diagnoses … that I believe covered all eventualities - we still got loads of others though." (Panellist 15, Round Two)

Therefore ICD-10 coding was eliminated from the data set and the diagnosis element was changed to that of EMS condition. Literature searches revealed that "EMS condition" is an accepted term for provisional diagnosis made by prehospital EMS providers (Spaite et al., 1995; Grafstein, Unger, Bullard and Innes, 2003; TEMSIS, 2004; MATRIS, 2006); however, based on opinion from Delphi panellists and the literature accessed, a separate exercise was deemed necessary to develop a comprehensive list of EMS conditions applicable to South Africa. This is outside the scope of this project and therefore will not be discussed any further, although it should be considered for further research (section 6.3).

4.2.2.8. Patient priority

Defining the patients' priority is essential, according to experts in both the FGD and Delphi study. However, as discussed below and based on the researcher's personal experience as well as informal conversations with numerous EMS providers it is clear that there are some problems in the prioritising or triaging of patients in the prehospital setting. Triaging in the EMS cannot be assumed to be either accurate or consistent. It is common practice in South African EMS to use a mass casualty style triage coding system for prioritising ambulance calls: patients with life threatening illness or injury are coded *red*; non-life threatened patients who still require an urgent response: *yellow;* and *green* means that the patient requires medical care but either at a low level or can wait many hours to days. Concerns with this system are: (i) that there is no clear guidance given for coding patients outside of a mass casualty; and (ii) that in practice most calls are classified either *red* or *yellow*, despite fitting the *green* criteria and (iii) that there is no consistency in prioritising patients (Lottering, 2005). This obviously makes the triaging unreliable, thus unsuitable for accurately describing patients' clinical condition.

Consequently when a panellist in the first round of the Delphi study suggested the use of the Triage Early Warning Score (TEWS), the researcher conducted a

literature search for the purpose of understanding and possibly using this triaging score to prioritise patients in the prehospital environment:

The TEWS system was developed in South Africa beginning in 2004 and gaining wide spread recognition by 2007 (Bateman, 2006; Wallis, Gottschalk, Wood, Bruijns, De Vries and Balfour, 2006; SATG, 2007). This triage tool is adapted from the physiologically-based Medical Early Warning Score (MEWS) with the addition of trauma and mobility factors to improve its applicability in trauma. TEWS has been validated by prospective studies in both the public and private health care settings (Gottschalk, 2007). Although TEWS has not yet been validated as a triage tool in the prehospital setting, its use in this setting is justified as it will not be used as a clinical tool but rather a means to identify patients' clinical status on arrival of the EMS in the defining of the patient population.

At least two of the panellists had not previously heard of TEWS but were not opposed to its use if either consistency were maintained or clear identification of the system was given.

One panellist was concerned as *"TEWS requires everybody to have the coded card as index which means it is going to have to be on the PRF just like the GCS cause no one will remember it by heart. Going to need lots of space or very small writing."* (Panellist 8, Round Two) However, if Panellist 15's (Round Two) advice in regards to time and distance is followed in this case, prioritising patients can be performed *"from the raw data as supplied by the clinician - there is no reason to ask them to undertake calculations in addition to all else that is required of them."*

Thus it was decided that patient priority could be removed from the MDS to be collected but remain an item in reports. Apart from one opposing view, this thought was approved by the Delphi panellists. In arguing for the inclusion of ECP determined priority, Panellist 10 (Round Three) commented that *"Yes, but has always been part of PRF's. Can also perhaps be used to see the difference between what priority is given to the patient by the crew, and then compared to what the score prioritises the patient as."* Obviously the first point in the comment is not scientific, a tradition is never a reason to continue to do something; the second point is relevant

but may be applicable in a clinical governance data set but not in a patient population data set.

Data elements that would need to be collected to complete this score are the following: mobility, trauma, AVPU score, respiratory rate, systolic blood pressure, heart rate, and temperature (SATG, 2007). These physiological indicators have been tested in South African hospitals and found to be accurate in determining patient priority alone, without the need for anatomical and clinical modifiers (Gottschalk, 2007; SATG, 2007). Thus it has been decided, based on the reliability of the TEWS tool, and the complexity of quantifying the anatomical modifiers (SATG, 2007) that only the physiological aspects will be considered for clinical priority decisions.

4.2.2.9. Interventions

Participant 5, an EMS educator, said that *"From a training point of view: it is important to identify which interventions are being done, what is being provided, why it is not being done?"* In response to this the Delphi panellists raised this pertinent question: *"Part of clinical record clearly, but does it add to our understanding of patient population"* (Panellist 15, Round Two). Interventions, including electrical therapy, intravenous fluids and medications, were deemed to not be part of a patient population data set as they did not necessarily point to the severity of the patients' condition but rather the management of the patient and were therefore removed from the list; they could be considered as part of a clinical governance or therapy data set.

4.2.2.10. Mechanism of injury and incident type

The focus group participants and Delphi study panellists were in agreement that the mechanism of injury is *"an easily determined and relatively accurate data element"* (Panellist 15, Round 3). Nevertheless there was strong opinion on the need to keep it simple to reduce subjectivity and keep the form brief. It was also emphasised that there must be some clarity *"concerning what MOI encompasses."* (Panellist 18, Round Three). The mechanism of injury can be synonymous with incident type, yet commonly incident types refer to both trauma and medical incidents and mechanism of injury refers only to trauma incidents.

4.2.2.11. Findings on scene

The focus group recommended that a distinction be made regarding the initial findings on scene of medical, trauma and interhospital transfer patients. While a clear description of how to document the initial findings was not developed, these findings were to cover the general clinical overview of the patient. A study of the literature and current PRF's (section 4.2) generated sub-elements for this data element (Table 4.1; seven consecutive elements from "primary and secondary survey findings" to "burns estimation") and were sent out with Delphi Round One. The focus group participants also recommended that the vital signs of the patient be captured; first vital signs can reasonably be considered as part of initial on scene findings. Data elements such as chief complaint and mechanism of injury, while considered as part of initial on scene findings are discussed separately in this chapter.

No positive response by the Delphi panellists was received on either the clear meaning or value of these sub-elements given the scope of this research (see comments in Appendix E). The outcome was that *"These are all important components of the clinical record, but will add little to our understanding of patient population"* (Panellist 15, Round Two). The expert panel were also in agreement that "loading factors" not be considered even in a clinical data set as it *"is an old and redundant system that no one can actually explain."* (Panellist 4, Round One). Due to the planned use of TEWS in the analysis of data gathered (see 4.2.2.8.) certain vital signs (see Table 4.1) and percentage of burns was retained in the patient population MDS. The inclusion of vital signs was of some concern, initially, to Panellist 15 (Round Two): *"It has research potential, but in terms of the scope of your project, I'm unsure of value".* This concern was allayed by a reduction in the number of vital signs collected to just those required by TEWS for prioritising a patient.

4.2.2.12. Medical history

The focus group concluded that a detailed medical history should be obtained, including medications that the patient is currently taking and events preceding incident or illness. It was also thought that recent travel history, nationality and usual place of residence would be of relevance to track global movement of disease. A study of the literature and available PRF's suggested a number of sub-categories for medical history, which included the items mentioned above (medications, events

preceding, travel history), and major co-morbidities, present history, chief complaint, “AMPLE” (**A**llergies, **M**edications, **P**ast and present pertinent history, **L**ast meal, **E**vents leading up to the incident) and findings on the scene. The Delphi panellists rejected most history description as repetitive (“AMPLE” covers most of the other sub-elements of history) or impractical to collect (recent travel history, nationality). Panellist 8 (Rounds One and Two) was of the strong opinion that the “AMPLE” history system is adequate for a clinical record while another panellist suggested that *“a simple series of checkboxes that identify major co-morbidities”* (Participant 15, Round Two) is sufficient as part of patient population description.

4.2.2.13. Times and distances

There was consensus amongst the FGD participants and the Delphi panellists that times and distances of the case be recorded. There was some discussion on the use of raw data versus ECP calculated data: e.g. recording of time mobile and time on scene vs. recording of response time to scene. The panellists agreed that collecting the raw data would allow for greater accuracy and decreased administration burden on the ECP’s. As it is ultimately intended that all data collected be captured onto an electronic database, individual calculations could be done at a later stage. As more vehicles become linked to satellite tracking systems this data could be collected via integration of the various software packages; that is however a separate discussion, not directly related to the aims of this project.

An interesting and valid point was made in that the data elements related to times gleaned from existing PRF’s did not allow for a differentiation between arrival on scene and arrival at the patient’s side. This is important because there could be a vast difference in these times, thus not reflecting the real time between dispatch to patient contact. The panellists recommended that this category be added to the patient population MDS.

Some confusion regarding time occurred between two panellists. One panellist mentioned that there is an international standard of accepted time criteria that should be considered and is used in all first world services, namely time call received, time vehicle mobile, time on scene, time at patient's side, time leave scene, time at hospital, time leave hospital, time back at base. Panellist 4 (Round Two) in response

stated that: *"The international standard is all fine and well, but – it is based on an economical situation very different to SA. Currently in the rural sectors of SA, it is sometimes in excess of 2 hours before any ambulance (pvt or government) can get to the scene of an incident, which obviously has massive implications for patient outcome. Even in an urban setting this challenge – at this stage predominantly the government sector is so overloaded that less than 20 min is considered a fantastic turn out."* This appeared to be an isolated incidence of confusion between international standards for recording ambulance times and meeting response times. Panellist 4 mentioned how the economic situation is different thus EMS would be hard pressed to meet response time targets, however the initial comment was on time definitions and not targets. The comment was therefore not considered as relevant to the topic or patient population.

Thompson and Schaffer (2002) discuss, in their research into aeromedical transport data, the importance of time as an *"indicator of the quality of the transport system"* (122) and state that system quality is as important as clinical care quality. A recent study on road traffic accidents (RTA) in Turkey was able to identify that certain types of RTAs were more prevalent at certain times of day (Aygencel, Karamercan, Ergin and Telatar, 2008); similarly Govindarajan and Schull (2003) showed that the time day of cardiac chest pain occurring affected the time to presentation at hospital. Thus it is clear that times of the incident are essential for describing the patient and are part of explanation of quality of care. Distance is a similar concept, like time it is used both for system quality and for patient demographic descriptors (DOH, 2000).

4.2.2.14. Personnel

The discussion on personnel, both in the focus group and the Delphi, was predominantly focussed around the level of care provided to the patient. Panellist 15 (Round Two) was of the opinion that *"it will enable us, in combination with the 'triage' and in some cases the trauma 'score' to triangulate patient severity."* There were however differing opinions on this where one panellist's judgement was that: *"This is a key component of understanding the severity of patients and therefore the resources required. I believe it should be a scope of practice thing, but this is also problematic because I believe that a proportion of patients require higher levels of care, but don't receive it. This categorisation therefore needs to be interpreted as the*

level of care provided (de facto) and not the level of care that should have been provided (optimum).” (Panellist 15, Round Two). This is directly contrary to Panellist 13’s (Round Two) views: *“What I feel should be included is the level of care that was actually required. Then we can say things like" of all calls responded to by ILS, 70% required only BLS intervention" this type of information is useful.”*

Consensus was difficult to obtain on this data element as some panellists equated personnel and level of care to billing, while others wanted to determine the appropriate use of resources. Still other panellists found “level of care” and “qualification level” synonymous, whereas another panellist wanted to put level of care according to capabilities (i.e. if an ALS practitioner provides only BLS skills then the level of care is BLS). The researcher came to the conclusion that no clear majority viewpoint was available but realised that this data element could be used in both clinical governance and resource management datasets but did little to define the patient population. The descriptions of the incidents (chief complaint, mechanism of injury, EMS condition, presenting injury) tend to provide a clearer picture, than personnel / level of care, of the patients’ conditions on arrival of the EMS.

4.2.2.15. Administration

The administration data elements were initially included when the scope of this study involved developing an entire patient report form. Once the scope was refocused (after Delphi Round One) onto describing the patient population, it was realised that they were not relevant. As the Delphi panellists have commented, some of this data is available elsewhere and the inclusion of it would just be adding to the administrative burden of the ECPs.

4.2.3. Conclusion

Consensus for 18 data elements and their associated codes for data collection methods were achieved in the final round of the Delphi study (Table 4.1). Table 4.2 shows a definition for each of the data elements that made the MDS, detailed notes are found in the user instructions (Appendix H). Throughout this phase, the questions shown below (and identified in section 3.2.2.6.1) were used to guide the selection of the potential data elements (Vaughn et al., 1996; Ulin et al., 2005). The

section numbers for specific examples for each question are shown together with the question.

- How should the population be described and what is it that we want to know about the population? (section 4.2.2.1)
- Why do we want to know about the population and how will this benefit EMS and our patients? (section 4.2.2.2)
- What data do we need to collect to describe the population? (section 4.2.2.14)
- How feasible is it to collect the required data? (section 4.2.1.7)

Table 4.2: Data elements definitions

Data Element	Definition
Date	The current day, month and year
District no.	Specific numbers assigned to districts (M)
Case no.	The unique incident number given by the EMS control centre
Date of Birth	Day, month and year of the patients' birth
Race	Common South African population groups to which the patient belongs, based on genetic ethnicity and skin colour (StatsSA, 2007; Cambridge University Press, 2008)
Exact age	The current age, in years, of the patient
Estimated age	The approximate age group of a patient (StatsSA, 2007; Cambridge University Press, 2008)
Gender	*"The physical condition of being male or female"* (Cambridge University Press, 2008)
Intent of trauma	*"The intent of the individual inflicting the injury"* (NEMSIS, 2006: E10_02)
Mechanism of injury	*"The way in which the person sustained the injury; how the person was injured; or the process by which the injury occurred"* (CDC, 2007)
Presenting injury	The main injury with which the patient presents following a traumatic mechanism of injury
Onset of medical complaint	Identifying if the symptoms are occurring for the first time or if they have occurred before
Chief complaint	*"The [brief] statement of the problem by the patient or the history provider"* (NEMSIS, 2006: E09_05)
EMS condition	A poor health condition identified by a combination of clinical features, similar to but not necessarily as precise as a diagnosis (NHTSA, 1993; Merriam-Webster, 2007)
Interhospital transfer	The transportation of a patient from one hospital to another hospital; does NOT included transport of a patient from a medical practitioner's rooms or a clinic to hospital.
Declaration of death	*"A clinical determination that ... death has occurred"* (AMDA, 2007: H03) and a broad indication of possible category of cause.
AVPU	A commonly used (in EMS) quick and simple neurological test of level of consciousness.
Skin thermal condition	A tactile impression of patients' body temperature based on 'normal'
Mobility	The way the patient is moved from the incident to the ambulance
Time mobile	The time the vehicle / crew were dispatched on the case
Time on scene	The time the vehicle / crew arrived on the scene of the incident
Time at patient	The time the crew arrived at the patient's side
Time left scene	The time the vehicle / crew left the scene

Data Element	Definition
Time at destination	The time the vehicle / crew arrived at the destination (if applicable)
Mileage mobile	The odometer reading on dispatch to the incident
Mileage at scene	The odometer reading on arrival on the scene of the incident
Mileage at destination	The odometer reading on arrival at destination
Location	The type of location at which the patient is found
Suburb	A subsection of the district, described in detail in user instructions
Transferring hospital	The hospital where the patient is collected from in an IHT
Response type	The broad reason for dispatch of the vehicle: primary response, assistance to on-scene crew, IHT.
Transport	The means by which the patient leaves the scene of the incident
Destination	Where the patient is transported to immediately following the incident
Pulse rate	The number of palpable beats occurring in a superficial artery over a minute (Merriam-Webster, 2007)
Respiration rate	The number of complete breaths occurring over a minute (Merriam-Webster, 2007)
Systolic blood pressure	*"The highest arterial blood pressure of a cardiac cycle occurring immediately after systole of the left ventricle of the heart"* (Merriam-Webster, 2007)
Diastolic blood pressure	*"The lowest arterial blood pressure of a cardiac cycle occurring during diastole of the heart"* (Merriam-Webster, 2007)

4.3. Phase Two: Developing the tool and formulating instructions for users

A form containing the agreed list of data elements was developed. This tool was then implemented on the DEMCR paramedic rapid response vehicle to further develop it. The methodology is described in 3.3.3. The results are discussed in detail hereafter and are also available on request.

4.3.1. Progression of tool development

The findings are presented as a brief description of the development of the tool through six versions, followed by more detailed notes on the discussion of the findings and researcher's actions. The six versions of the form are presented as Figures 4.2 to 4.7; changes to these forms are indicated by lettered ovals. Reference will be made to the changes as follows: Fig 4.2 – A / Fig 4.3 – G, H; this will indicate that the change identified in version 1 (Figure 4.2) shown at 'A' has occurred in version 2 (Figure 4.3) and shown at 'G' and 'H'.

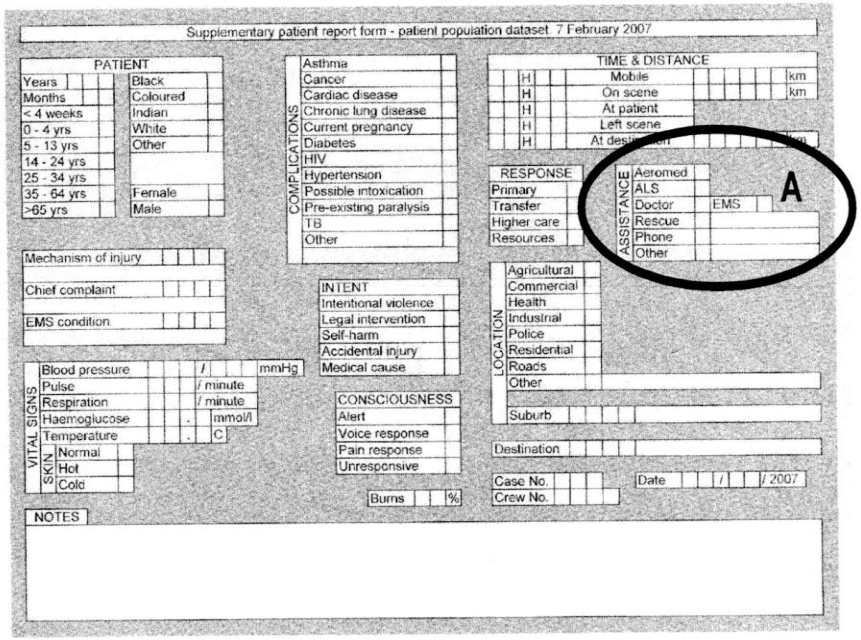


Figure 4.2: Version 1

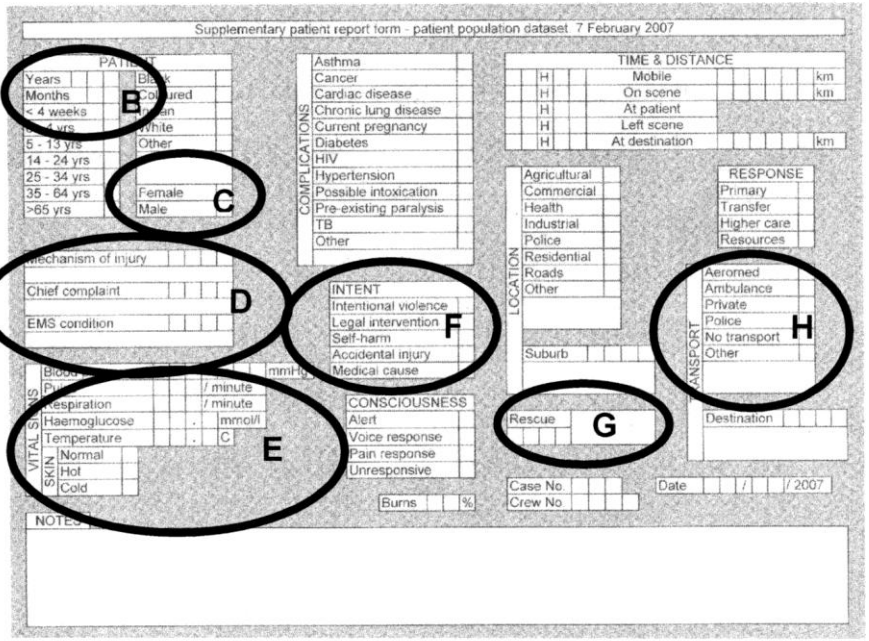


Figure 4.3: Version 2

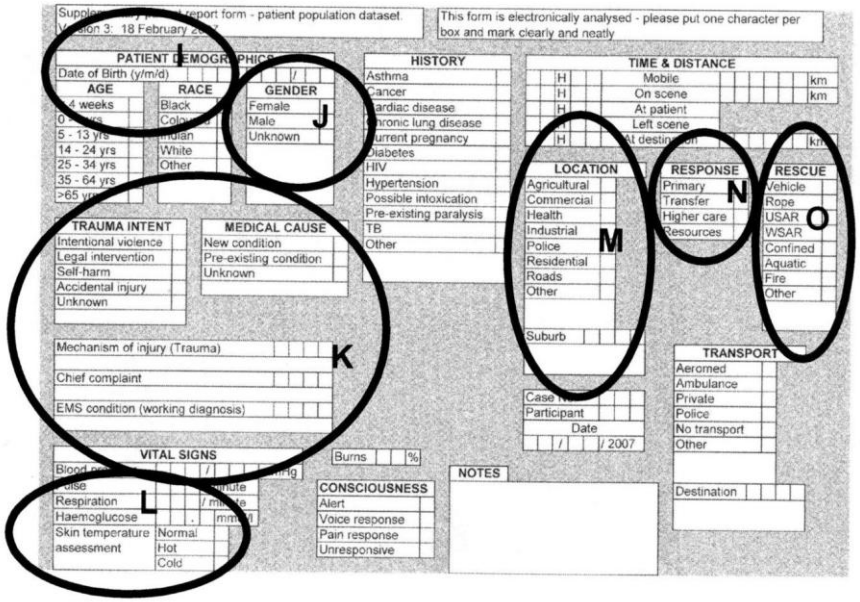


Figure 4.4: Version 3

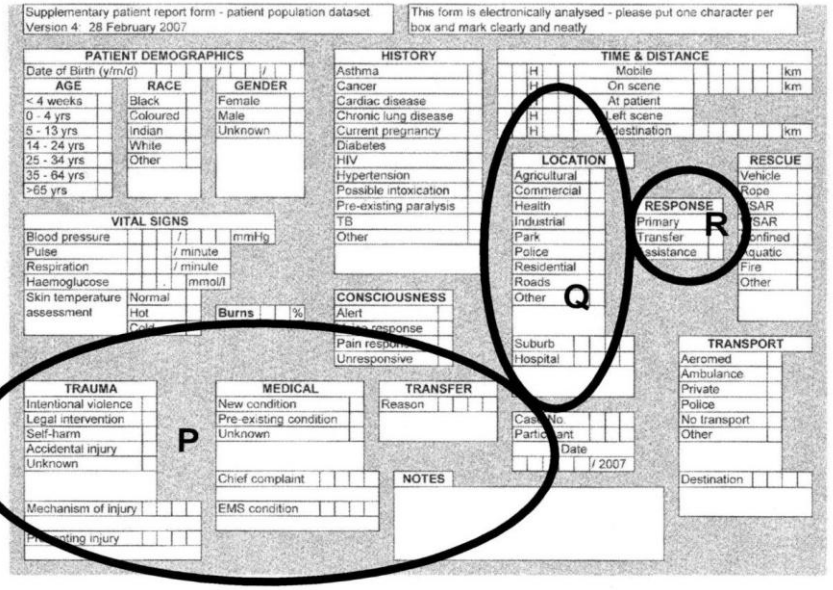


Figure 4.5: Version 4

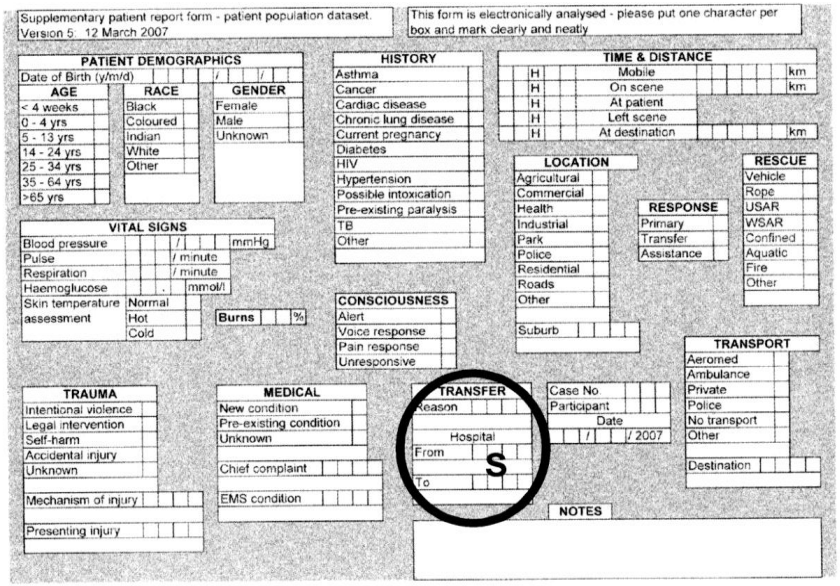


Figure 4.6: Version 5

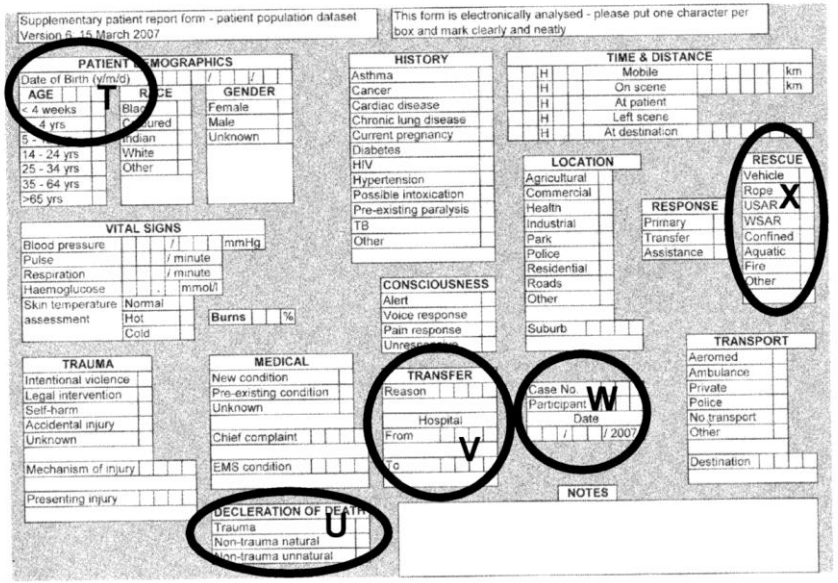


Figure 4.7: Version 6

As noted, the first version of the PRF comprised of the 18 data elements identified in the Delphi study (Table 4.1). This form was piloted over two shifts of the DEMCR paramedic rapid response vehicle and completed by a lecturer / paramedic; only two patients were seen during this time. The second version was also piloted by a DEMCR lecturer with only one patient being seen; however, a number of issues regarding the user instructions were raised – these are discussed in section 4.3.1.2. The major change to version three was a partial split of medical and trauma incidents (4.3.1.5).

The participants involved in piloting the third version were DEMCR students (second and third year) and lecturers. Eight forms were completed and analysed. It was found that incorrect form completion was due to participants being unaware of what was expected and not reading the user instructions. Most of the reasons for changes in the form were identified during the test of this version; however some changes did not occur until later owing to the short time between interviewing the participants and releasing the next version of the tool. This was the case with a specific section on “declaration of death”, identified as a need during the trial of version two but only added in the sixth version.

The record reviews, evaluations and interviews conducted during the testing of version four revealed the need for a minor change in the form layout (compare Figures 4.5 and 4.6)as well as for detailed participant education and the use of the user instructions when completing the form. Nine forms of this version were completed by second and third year DEMCR students.

No problems were identified with the two version five forms that were completed by a second year paramedic student, thus only two changes were made to develop version six: the addition of a declaration of death section and a return to collecting the exact age in years (discussed in section 4.3.1.4).

No issues requiring form change were noted following the use and evaluation of version six (seven forms). This version of the form and user instructions was found to be easy to use and appeared to collect the required data. The form was given to Galdon Data, TeleForm® consultants, for development into a form able to be put

through automatic data capturing (ADC) for use in Phase 3; ADC was not to be tested in Phase Three but the tool was developed for future use (section 6.3). This phase was completed with the development of this form and finalisation of the user instructions.

4.3.1.1. Assistance (Fig 4.2 – A / Fig 4.3 – G, H)

In testing version one, this element was found to be both confusing and irrelevant as it is linked to the level of health care provider initially on scene and delivering the care, however that element was excluded in the fourth round (Table 4.1); this is related to the discussion in the Delphi study (section 4.2.2.14.) Further a situation could exist when one of the selections in the 'Assistance' element does arrive on scene but is not required to use his expertise, thus confounding its completion. To complete this element some other data on transportation, rescue, and telephonic advice was also required. Yet no complete data on the means by which the patient was transport from the scene is collected. The researcher agreed that, in light of this input and the Delphi panellists' comments on personnel (see 4.2.2.14), changes would consist of replacing the 'Assistance' data element with two data elements: 'Rescue' and 'Transport' as these elements speak to the reason for using the EMS and the patient's access to health care.

4.3.1.2. Form design (Fig 4.3 / Fig 4.4)

As discussed above, the piloting of the second version of the form yielded a number of form design considerations. Despite these issues not being part of the MDS and therefore not under consideration during the development of the tool, they do have an impact on how the tool is completed (see section 2.3.2). Thus without this study being about the technical aspects of form design, where there are concerns addressed by the participants these have been addressed. Specific issues were:

- Improvement of the data element labels as these were not specific enough or detailed enough for the participant to accurately determine what data was required for completion. Labelling was changed to be more descriptive and easier to identify (bold and centred above data element)
- There was some confusion with the term "crew number" as this is a term in common use in KZN EMRS. This was changed to "participant".

- It was not considered to put one character per box, rather the vital signs were just written across the spaces; this problem did not reoccur as a note was placed on the form indicating the need to write one character per block.

4.3.1.3. Temperature / skin temperature assessment (Fig 4.3 – E / Fig 4.4 – L)

In the first two versions of the form, two data collection methods were used to describe temperature – an exact temperature reading expressed in degrees Celsius and a tactile skin assessment, where the temperature is estimated and categorised into hot, cold or normal. The participant using version two expressed concern about the general lack of use and availability of thermometers in the prehospital EMS. This was confirmed by the researcher's personal experience as well as in discussion with a number of prehospital providers. Given the criterion of feasibility of collection used for selection of elements in the FGD as well as discussion in section 2.3.1 to the effect that it is not worthwhile to spend resources collecting data that is unobtainable, it was decided that only the tactile assessment would be used for data collection. In further support of this decision, no study participant (in the remainder of Phase Two or in Phase Three) raised the absence of this aspect as a concern.

4.3.1.4. Age / Date of birth (Fig 4.3 – E / Fig 4.4 – L / Fig 4.7 – T)

In discussing version two, the participant was of the opinion that a ‘date of birth’ space would probably lead to more accurate data then having a space for ‘years’ and ‘months’ as insufficient detail was contained on the PRF to describe what was required. In fact this participant placed the patient in an age category based on his date of birth rather that writing down his exact age in the space provided. The researcher agreed with this as date of birth is a common request on health care charts. However, in version three, participants pointed out that age is more commonly requested than the date of birth. Further forms completed in Phases Two and Three confirm that date of birth is not commonly obtained prehospitally. To address these two challenges, the element for age was labelled as “age” and not “years” or “months” and space was allocated for date of birth in the sixth version.

4.3.1.5. Trauma, medical and interhospital transfer cases (Fig 4.3 – D, F / Fig 4.4 – K / Fig 4.5 – P / Fig 4.7 - U)

There has been much development in this area of the tool. Initially it was assumed that for each incident, a participant would complete a mechanism of injury, a chief complaint and an EMS condition. However in the analyses of versions two and three it became evident that the participants made a clear distinction between trauma and medical incidents. It was also found that there was both irrelevancy and redundancy in the categories. Trauma patients tended to have a similar chief complaint and EMS condition and there did not seem to be a need for an EMS condition as a number of clinical complaints can arise from a single traumatic injury. Thus, for trauma a mechanism of injury and a presenting injury provide sufficient data on how the patient was injured and what the major injury is. Similarly, it is neither easy nor logical to assign a mechanism of injury to medical patients but rather a chief complaint (or reason for calling). These distinctions appear to be reinforced by education, which divides learning into these categories; hospitals which have separate emergency departments for medical and trauma patients; and control rooms that classify cases in one of these two categories.

Further, IHTs were viewed as being distinct from prehospital cases. The reasons for these transfers are an important population descriptor as they may represent a large proportion of patients, and their inclusion as part of the chief complaint and EMS condition led to confusion. Thus a separate section was developed to record the reason for IHT.

Although acknowledged as being part of the primary response to either a medical or trauma case, the declaration of death was not explicitly contained within the existing data elements. At times paramedics may be required to declare death on an obviously dead patient where they cannot identify the mechanism of injury and the patient's only complaint is that he is dead. An element was therefore created to collect data on declaration of death. As discussed above, although this was identified as a concern in the analysis of the third version, it was only included in version six. The researcher does not think that this delay had any significant impact as no participants attended any deceased patients in the testing of versions four, five and six.

It must be noted that trauma and medical cases are not mutually exclusive. As required multiple sections can be completed; in fact one of the motivators for changes (from one incident description to a split between medical and trauma primary responses and IHT) is that a participant had a patient with two problems, one distinctly medical (hypoglycaemia) and the other trauma (gunshot leg) and that the conditions were only related in that the one condition, hypoglycaemia, lead to the second condition, gunshot by police considering the patient a disturbance of the peace and resisting arrest.

4.3.1.6. Location (Fig 4.4 – M / Fig 4.5 – Q)

In version three's analysis it was found that the specific location section was missing a section for parks, beaches and other public open spaces. The participant felt that a significant number of patients come from these areas and this was not adequately catered for under "other". A category "Parks" was added to accommodate public open spaces.

4.3.1.7. Response (Fig 4.4 – N / Fig 4.5 – R)

There was some confusion during the completion of version three, when a paramedic unit was part of the initial dispatch to a call but arrived after the ambulance; the participant thought that "response type" could then be either primary or higher care. The user instructions were clear on this matter – a primary response is any unit mobilised as part of the initial dispatch. While addressing this matter, the researcher considered the response type and concluded that "higher care" and "resources" should be collapsed into "assistance".

4.3.1.8. Move from version six to Phase Three form

A few changes were made from the final version of the form used in Phase Two to the form used in Phase Three. The changes can be visualised by comparing figures 4.7 and 4.8. These changes were either for practicality and space (changing the element "rescue" from tick-boxes to a code space) or on advice of the forms design consultant (creating a unique identifier by combining the date with the district and case numbers).

It was also decided to include a list of clinical presentations based on the TEWS triaging system (see section 4.2.2.8.). These were only included at this time of the study as the researcher was in the process of understanding the entire TEWS system and attempting to adapt it for prehospital use. These clinical presentation elements are not a complete list of all those possible, but rather the moderators that TEWS uses in conjunction with the physiological parameters to determine the patients' priority.

4.3.2. User instruction formulation

From the third version of the form emphasis began to be placed on not only what data elements were required but how they should be completed. There were very few changes to the form recommended by the participants from version four. However it became increasingly evident that the user instructions needed refining and the participants required education in the completion of the form. There were only three specific issues of relevance regarding the user instructions and these are detailed below (4.3.2.1 – 4.3.2.3). Changes to the user instructions were predominantly based on the changes to the form and not in response to participants' experiences.

The value of this phase, and participants' experience was that the user instructions could be refined to be more user-friendly and explain the completion of the form in a manner that is easier to understand. This phase also showed the importance of proper education in completing the form and the value of user instructions when dealing with a new instrument.

4.3.2.1. AVPU

Concern was raised with the AVPU (Alert, responds to Voice, responds to Pain, Unresponsive) scale of patient consciousness as it does not distinguish between conscious patients who are alert but either confused or lucid. As this data element is used to determine the patients' clinical condition in conjunction other vital signs by means of the TEWS triage scale (4.2.2.8.) it was appropriate to discuss the matter with Wallis, one of the primary researchers in the development of this tool (Wallis et al., 2006). He stated that they had found no significance in the severity of patients between these two levels of alertness. No changes were made.

4.3.2.2. Vital signs

Participants attended to a particular incident where they were part of the initial dispatch but arrived on scene after the ambulance. There was some confusion about which vital signs to use for the patient – on arrival of the first arriving crews or on arrival of those collecting the data. The confusion was compounded by the fact that the patient was initially spontaneously ventilating but was being assisted by the time the participant arrived. As discussed in 4.2.2.1 the reason for collecting the vital signs is to determine the patients' initial priority, thus the vital signs on arrival should be recorded. However this is not of great concern for a number of reasons: (i) the researcher hopes that eventually all prehospital EMS PRF's will contain this MDS (including the first arriving crew); (ii) in a primary response there usually is not a great difference between all the arriving vehicles and crew; and (iii) if an on-scene ECP requests assistance, then the priority is calculated by the assisting ECP on arrival. Thus, this concern is not addressed on the tool itself but in the user instructions.

4.3.2.3. Transport

The opinion of a third version participant is that it is important in the description of the patient population to identify where the patient was transported to from the incident even when EMS did not transport them. The researcher agreed with this and amended the user instructions accordingly.

4.3.2.4. General concerns about user instructions

There were a number of instances where incorrect codes were used or a selection made where one should not have been made. Most of these issues occurred in the first five versions, specifically version four and five. This was to be expected as the participants were given the form and user instructions but without education until the sixth round (see section 3.3.6.2). These problems did not require changes to the user instructions, except where discussed above.

4.4. Conclusion

Phases One and Two completed the development of the MDS and the data collection tool (with instructions). These phases addressed the abstract idea of "what data do we need to collect to determine who our patient is". The findings of these

phases guided the third phase – testing of the tool (see 3.4). Even when they did not result in tool or user instruction changes, participant comments were valuable in guiding the education required for the Phase Three participants.

5. CHAPTER FIVE: Findings Phase Three

5.1. Introduction

"Methodological research examines methods of obtaining and analysing data and addresses the development, validation and evaluation of research tools or methods." (Polit and Beck, 2006: 243). In the previous chapter, detailing the findings of Phases One and Two, discussion dealt with the development of the tool. In this chapter the discussion will cover the evaluation of the tool, specifically the opinions of the intended users on how they experienced the use of the form, the ease of data collection and the perceived appropriateness (face validity) of the tool.

While the first two phases of this study were qualitative only, Phase Three is a mixed method design (discussed in section 3.4.2): participant opinion was analysed in a qualitative manner while the evaluation of the completeness of data collection by use of the tool has been subjected to quantitative analysis (Polit and Beck, 2006).

5.2. Data collection

5.2.1. Participants

As discussed in section 3.3.2, all 11 ALS paramedics with whom the researcher was able to communicate with regarding this project agreed to participate in the trial. Two of the participants voluntarily left the study without collecting any data, while another two changed employment and thus completed only one of the two months of data collection. The reasons the two participants gave for totally withdrawing from the project was lack of time to complete the tool whilst on duty. The researcher realised, during the course of this phase, two reasons for these time constraints:

i. There is currently a high attrition rate amongst the ALS paramedics within the KZN EMRS. During the two month period of this phase, two of the participants resigned employment and replacements were not hired. This is not an uncommon occurrence within this particular EMS; there appears to be a shortage of ECP-As and limited effort (based on informal discussion with staff as well as the researcher's experience as a manager in the service) made to retain them.
ii. While the ECP-As are not required to complete a PRF for each patient they have seen; provided they enter their findings, management and signature on

the ambulance crews' PRF; it is becoming more common for them to complete a PRF for each patient for their own records – thus having two forms.

5.2.2. Completed forms

From the nine participants (initially 11 but 2 did not complete any forms (see section 5.2.1) a total of 265 completed forms were obtained; Table 5.1 shows how many forms submitted by each participant. These forms have been analysed for completeness (see section 5.4).

Table 5.1: Number of completed forms per participant in Phase Three

Participant	District	Number of forms
1	Urban	35
2	Urban	16
3	Urban	43
4	Urban	81
5	Rural	10
6	Rural	18
7	Urban	19
8	Urban	21
9	Rural	22

5.3. Participants' opinions of the tool

A general opinion expressed by the ECP-A's during their introduction to this project (section 3.4.5.1) was that this is valuable research and that they were happy to participate; this was confirmed by the researcher during the interviews with the participants (section 3.4.6.1). The paramedics appeared to appreciate participating in research relevant to their field and did not seem to consider the change in their usual data collection methods to be onerous. The opinion expressed by some of the participants that this type of study should be considered for permanent implementation and the mostly positive response to participation are encouraging for further research in this field.

Concerns expressed by the users during the interviews are shown in Table 5.2 and can be classified into four main areas: operational issues, user instructions, coding and data elements; each will be presented and discussed below.

Table 5.2: Participants' concerns with data collection tool and user instructions

Participants	Concerns
5, 6, 9, 10	Cause of maternity incident – e.g. labour, eclampsia
5, 6, 9, 10	Air and ground ambulance may be used in the same patient – time delays
5, 6. 9, 10	Not all the hospitals on code list – Town Hill
4, 6	Clinical presentation list not exhaustive
4, 5	EMS conditions need to be more specific on certain diagnoses (e.g. CCF) or when the patient knows that they are having an acute exacerbation of a pre-existing illness
4	Some presenting injuries missing soft tissue injuries) while others are too specific (e.g. lower leg # and lower leg dislocation)
4	EMS conditions limited for green code use
4, 6	Medical conditions – uncertain in OD / pregnancy – is it a new condition or not
4	Mobility and pain should be separate sections and not included in clinical presentation
4, 5, 6	Chief complaint should included medical conditions in cases when EMS is called for a specific group of symptoms that individually are non-significant but together indicate exacerbation of a condition the patient suffers from and is calling specifically for; e.g. asthma, COPD, angina
2, 5	IHT needs to include as a reason public to private or visa versa and hot-box
5	Presenting injury should included area burnt
6	Should include pt meds and defaulting
6	User instructions need more detail to assist in choosing codes, e.g. syncope and decreased LOC non-trauma
6	User instructions time wasting but tool is simple and serves as a memory jogger for data collection
4	Confusion regarding roads and commercial for e.g. if pt were found in a commercial area on the road
7	May be more than one chief complaint or EMS condition in a single patient
2	Clinic to hospital transfers – primary or transfer?
2, 4	Coding should use local industry lingo – e.g. common abbreviations as codes. “Field” input must come from the crews. Research need here to become user friendly and complete.
3, 4, 5	DOB not a commonly requested or easily obtainable element

5.3.1. Operational issues

Four participants were concerned that the difference between times recorded for “on scene” and “at destination” would indicate an unacceptably long patient transfer time when there was a delay in getting a ground ambulance to meet an air ambulance, thus reflecting badly on the air ambulance staff. The reason for this concern was because ground ambulances are often used to get a patient from the scene to a suitable landing site and from a landing site to the hospital (following the flight). The participants were concerned that this would result in time delays, thus reflecting poorly on the air ambulance service. The researcher is of the opinion that the time delays would be an accurate representation of a patient’s prehospital time and thus be a reasonable indication of the patient’s access to definitive in-hospital medical

care. The researcher is aware of the clinical governance and resource management issues, which would certainly need to be resolved; however as a purely patient description data element, these time delays would provide important, accurate data.

It does however raise a concern regarding the integration of patient data; while it is expected that data from the operational EMS setting must be correlated with that of the communications centre and hospitals (Atkin, Freedman, Rosenfeld, Fitzgerald and Kossmann, 2005), it may not be apparent that different EMS services may be providing prehospital / out-of-hospital medical management and transportation for the same patient in the same incident.

5.3.2. User instructions

One particular participant indicated that the user instructions were *"time wasting"* as the tool is simple to use. However, that same person stated also that the user instructions required more detail to assist in choosing codes. These statements appear to be contradictory, however it is both an indication that the data required by each field is understandable (one of the purposes of Phase Two) and that a new system (using codes instead of free text) takes some time to get used to.

Specific questions that were raised.

i. When recording pregnancy or overdose, should they be indicated as new or pre-existing conditions (5 participants)?
ii. When a patient is found on a road in a commercial environment how should it be indicated in the location section ("commercial" or "road") (1 participant)?
iii. Should transport of a patient from a clinic be indicated as a primary response or interfacility transfer (1 participant)?
iv. If there is more than one chief complaint, EMS condition or presenting injury how does this get recorded (1 participant)?

The first three concerns relate to data requirements for patient management and highlight the need for the user instructions to be more specific. The issue of how to classify pregnancy /obstetric emergencies may be solved by moving away from the

traditional EMS approach of “medical” or “trauma” divisions only to the nursing approach of including a “gynaecological” section (Paldi, Porath, Friedman and Mozes, 1995). This is, however, a classification issue along with the other issues raised (location, overdose, primary response versus interfacility transfer) and will require more study (outside this project) to correctly categorise all data elements (section 6.3). The last question is a coding matter and will be discussed in the next section.

5.3.3. Coding of data elements

Coding of data elements was the most prominent of the difficulties mentioned in this section encountered by the participants during the data collection. These difficulties could be divided into either concern about the data being collected or concern with the actual name or label of the code. The concern with the data being collected was that there is insufficient detail about some medical conditions and too much about others.

i. “EMS condition” is not specific enough for obstetric cases or in certain diagnoses (e.g. CCF) (six participants);
ii. In “chief complaint” no provision is made for a specific diagnosis as may occur when the patient (or family) is aware of the patient’s specific diagnosis due to a collection of (possibly insignificant) clinical features and is thus requesting the EMS for a specific condition rather than a generalised complaint; presently the “chief complaint” only has codes for clinical features (three participants).
iii. The coding for the “presenting injury” data element was believed to be too detailed. For example, an ECP could choose lower limb fracture, lower limb dislocation, lower limb amputation, lower limb blunt trauma or lower limb penetrating trauma for a lower limb musculo-sketal injury. It was further felt that these codes, while useful for seriously ill or injured patients, were of limited value in patients with minor complaints (two participants).

The concerns with the actual names or labels of the codes was that they were not using “industry lingo” (six participants); for example the ECP’s tend to use the

abbreviation “KEH” when talking about King Edward VIII hospital but the code selected was “KEDW”. The researcher realises that while a broad spectrum of potential users of the data were involved in formulating the MDS the initial users of the form / data collectors were not involved in the developmental stages. The issues regarding codes – availability, names, labels and abbreviations could be resolved through discussion with the operational EMS personnel – the initial users of the tool (section 6.3).

5.3.4. Data elements

Participants requested the inclusion of data regarding what the patient's current medications are and whether or not they default. The researcher believes that this would be valuable in a clinical dataset, but that it is not really relevant in the patient population dataset. Data on medication being taken is not particularly useful for characterising the user population. Participants also requested that the mobility assessment should be a separate section from other clinical data as it is an element that must be completed for all patients (it is comprised of three choices – walking, walking with assistance and immobilised / stretcher). The researcher concurs with the mobility assessment; this is a form layout issue.

Participants in Phase Two (section 4.3.1.4) commented that the DOB is not commonly requested by the ECP’s, and that when it is requested it is usually not obtained due to patients not knowing it. From his personal experience as an operational paramedic, the researcher accepts this as a valid concern, but believes that it can change overtime. Until then this data can be collected as is with out serious concerns about the data quality as exact age and estimated age are also useful in describing the patients’ demographic profiles and medical priority (see sections 3.4.7.2 and 5.4.1.1, Table 4.1 and Chart 5.1).

Overall the participants were positive about completing the tool and could relate to the potential benefits of collecting this data. The difficulties encountered in this phase are easily resolvable.

5.4. Completeness of data collected with the tool

An Excel® (Microsoft corporation) spreadsheet was use to develop a completeness database of all data elements (and sub-elements) that formed part of the MDS. Some data elements were applicable to all records and data should have been recorded for every patient. However, other data elements were only applicable for certain types of patients, and therefore it was appropriate that data would not have been recorded. In the latter case, this would not be regarded as an incompletely recorded data element. Table 5.3 indicates the percentage completeness of data for the data elements, based on the 265 records reviewed. The applicability of the data elements is discussed in sections 5.4.1 and 5.4.2. The complete and incomplete percentages (and numbers) are comprised of only those records which were applicable to the data element. The applicable and not applicable scores are based on the total (N=265) of all records reviewed.

In certain cases, data elements comprise a number of sub-elements. In such cases, these data elements were unpacked and their sub-elements regarded as data elements for this review. An example is the data element “vital signs” which is comprised of heart rate, systolic and diastolic blood pressure, respiration rate, AVPU score, and temperature. Therefore, in place of a single data element, six elements are reviewed in the table and discussion below.

Certain data elements have been found to be irrelevant for characterising the patient population or not applicable for this study; these elements are marked in the table with an asterisk (*) and dagger (†) respectively. They will be discussed in detail in section 5.4.2.

Table 5.3: Degree of completeness and applicability of data collected in respect of data elements

Data element	Complete % (n)	Incomplete % (n)	Applicable % (N)	Not applicable % (N)	Section
Date	100.00 (265)	0.00 (0)	100.00 (265)	0.00 (0)	5.4.3.1
District no.	96.23 (255)	3.77 (10)	100.00 (265)	0.00 (0)	5.4.3.1
Case no.	100.00 (265)	0.00 (0)	100.00 (265)	0.00 (0)	5.4.3.1
Date of Birth	15.09 (40)	84.91 (225)	100.00 (265)	0.00 (0)	5.4.3.1 5.4.3.4
Race	95.85 (254)	4.15 (11)	100.00 (265)	0.00 (0)	5.4.3.1
Exact age	63.40 (168)	36.60 (97)	100.00 (265)	0.00 (0)	5.4.3.1 5.4.3.4
Estimated age	95.88 (93)	4.12 (4)	36.60 (97)	63.40 (168)	5.4.3.1 5.4.3.4
Gender	94.72 (251)	5.28 (14)	100.00 (265)	0.00 (0)	5.4.3.1
Intent of trauma	97.98 (97)	2.02 (2)	37.36 (99)	62.64 (166)	5.4.3.4
Mechanism of injury	95.96 (95)	4.04 (4)	37.36 (99)	62.64 (166)	5.4.3.4
Presenting injury	89.90 (89)	10.10 (10)	37.36 (99)	62.64 (166)	5.4.3.4
Onset of medical symptoms	84.21 (112)	15.79 (21)	50.19 (133)	49.81 (132)	5.4.3.4
Chief complaint	93.23 (124)	6.77 (9)	50.19 (133)	49.81 (132)	5.4.3.4
EMS condition	92.48 (123)	7.52 (10)	50.19 (133)	49.81 (132)	5.4.3.4
Interhospital transfer	88.68 (47)	11.32 (6)	20.00 (53)	80.00 (212)	5.4.3.4
Declaration of death	100.00 (32)	0.00 (0)	12.08 (32)	87.92 (233)	5.4.3.4
AVPU	97.85 (228)	2.15 (5)	87.92 (233)	12.08 (32)	5.4.3.4
Skin thermal condition	87.12 (203)	12.88 (30)	87.92 (233)	12.08 (32)	5.4.3.4
Mobility	79.40 (185)	20.60 (48)	87.92 (233)	12.08 (32)	5.4.3.4
Time mobile	99.00 (263)	1.00 (2)	100.00 (265)	0.00 (0)	5.4.3.2
Time on scene	98.87 (262)	1.13 (3)	100.00 (265)	0.00 (0)	5.4.3.2
Time at patient	97.74 (259)	2.26 (6)	100.00 (265)	0.00 (0)	5.4.3.2
Time left scene	92.08 (244)	7.92 (21)	100.00 (265)	0.00 (0)	5.4.3.2
Time at destination†	43.77 (116)	56.23 (149)	100.00 (265)	0.00 (0)	5.4.2
Mileage mobile	89.81 (238)	10.19 (27)	100.00 (265)	0.00 (0)	5.4.3.3
Mileage at scene	89.43 (237)	10.19 (27)	100.00 (265)	0.00 (0)	5.4.3.3
Mileage at destination†	37.36 (99)	62.64 (166)	100.00 (265)	0.00 (0)	5.4.2
Location	94.34 (250)	5.66 (15)	100.00 (265)	0.00 (0)	5.4.3.3
Suburb	74.06 (157)	25.94 (55)	80.00 (212)	20.00 (53)	5.4.3.3
Transferring hospital	79.25 (42)	20.75 (11)	20.00 (53)	80.00 (212)	5.4.3.3
Response*	94.72 (251)	5.28 (14)	100.00 (265)	0.00 (0)	5.4.2
Transport	94.72 (251)	5.28 (14)	100.00 (265)	0.00 (0)	5.4.3.5
Destination	84.15 (223)	15.85 (42)	100.00 (265)	0.00 (0)	5.4.3.5
Pulse	100.00 (233)	0.00 (0)	87.92 (233)	12.08 (32)	5.4.3.4
Respiration	99.75 (232)	0.43 (1)	87.92 (233)	12.08 (32)	5.4.3.4
Systolic blood pressure	93.99 (219)	6.01 (14)	87.92 (233)	12.08 (32)	5.4.3.4
Diastolic blood pressure*	92.70 (216)	7.30 (17)	87.92 (233)	12.08 (32)	5.4.2
Paramedic signature†	99.25 (263)	0.75 (2)	100.00 (265)	0.00 (0)	5.4.2

Other data elements, namely percentage burns, medical history and clinical presentation, could not be assessed for completeness as these sections could remain uncompleted due to incomplete recording or because of no abnormalities being found; they were therefore not included in the table and the following discussion.

The relevant data elements have been combined to check that the tool collects data to answer the following questions regarding the EMS patient population: who is using the EMS, when and where is it being used, why is the EMS used and how does the service get used? The completeness of data collected for these elements is discussed in greater depth in section 5.4.3; the specific sections for discussion of each data element are indicated in the table.

5.4.1. Applicability of data elements

5.4.1.1. Estimated age

Age is essential data that should be collected (sections 5.4.4.1 and Charts 5.2 and 5.8) and is ideally captured in its rawest form, i.e. date of birth (DOB) or exact age. However in certain cases it is impossible to obtain an accurate age and in these cases an estimated age is obtained. It is only applicable to obtain an estimated age when the exact age is indeterminable; this was indicated in such manner in the user instructions for data collection. Therefore the “estimate age” is only applicable in 36.6% of the records reviewed.

5.4.1.2. Incident types

The incident types of medical and trauma emergencies, interhospital transfers and declaration of death are each applicable only when that type of case was attended to. The researcher accepted that if any of the three data elements for either medical (onset, chief complaint, EMS condition) or trauma (intent, mechanism of injury, presenting injury) were present then the incident type could be categorised as medical or trauma respectively. Similarly if either of the two interhospital transfer elements (interhospital transfer reason code, transferring hospital) or the declaration of death element were completed then the incident type of the record could be classified as applicable. Figure 5.1 illustrates this; there are 5 enlarged areas

labelled “A” to “D” (there are two “C” labels as IHTs are split). In area “B” there are three sections (onset of symptoms, chief complaint and EMS condition) related to a medical incident. If any one of these sections is completed then it can be assumed that the call responded to is a medical incident.

In this example (Figure 5.1) it is clear that two of the three medical sections (area B) and one of the two IHT transfer sections (areas C) are completed, thus it can be determined that it is both a medical incident and an interhospital transfer. In the medical section the “onset of the symptoms” has not been completed, consequently it will be recorded as incomplete data (Chart 5.6). In the IHT section the “transferring hospital” is not completed but the “reason” is; thus more incomplete data. As no selections have been made, or codes written in areas “A” and “D” it indicates that this was not a “trauma” or “declaration of death” incident; therefore they are considered not applicable in this instance (Table 5.3).

Of the 265 records filled in (by participants) and reviewed (by researcher), 37.36% were found to be trauma cases as data was collected in one or more of the trauma sections. Similarly it was found that 50.19% of the records dealt with medical cases. Interhospital transfers comprised 20% of the records and patient deaths were found in 12.8% of cases. It is noted that the sum is greater than 100%; this is due to a number of data collection issues and not necessarily data analysis inconsistencies.

- It is possible for a patient to simultaneously experience both a trauma and a medical emergency (e.g. an acute myocardial infarction while driving with a resultant motor vehicle collision).
- A patient may have died from traumatic injuries and thus be recorded in both the trauma and the declaration of death sections.
- Participants in some instances completed both the medical or trauma section and the interhospital transfer section, while the user instructions were quite clear that this should not occur. This could be considered an area that requires improvement in the user instructions which should be considered; especially in light of the comments made that some parts of the user instructions were not detailed sufficiently while other areas were perhaps to simplistic (see section 5.3.2).

- As death only had one data element, incompleteness of this category could not be determined in a similar fashion as “trauma”, “medical” or “IHT” (see previous paragraphs of this section). Thus of the 32 cases in which the patient was indicated as dead, 100% were completed.
-
- Further work is required in the categorisation of data elements (section 6.3).

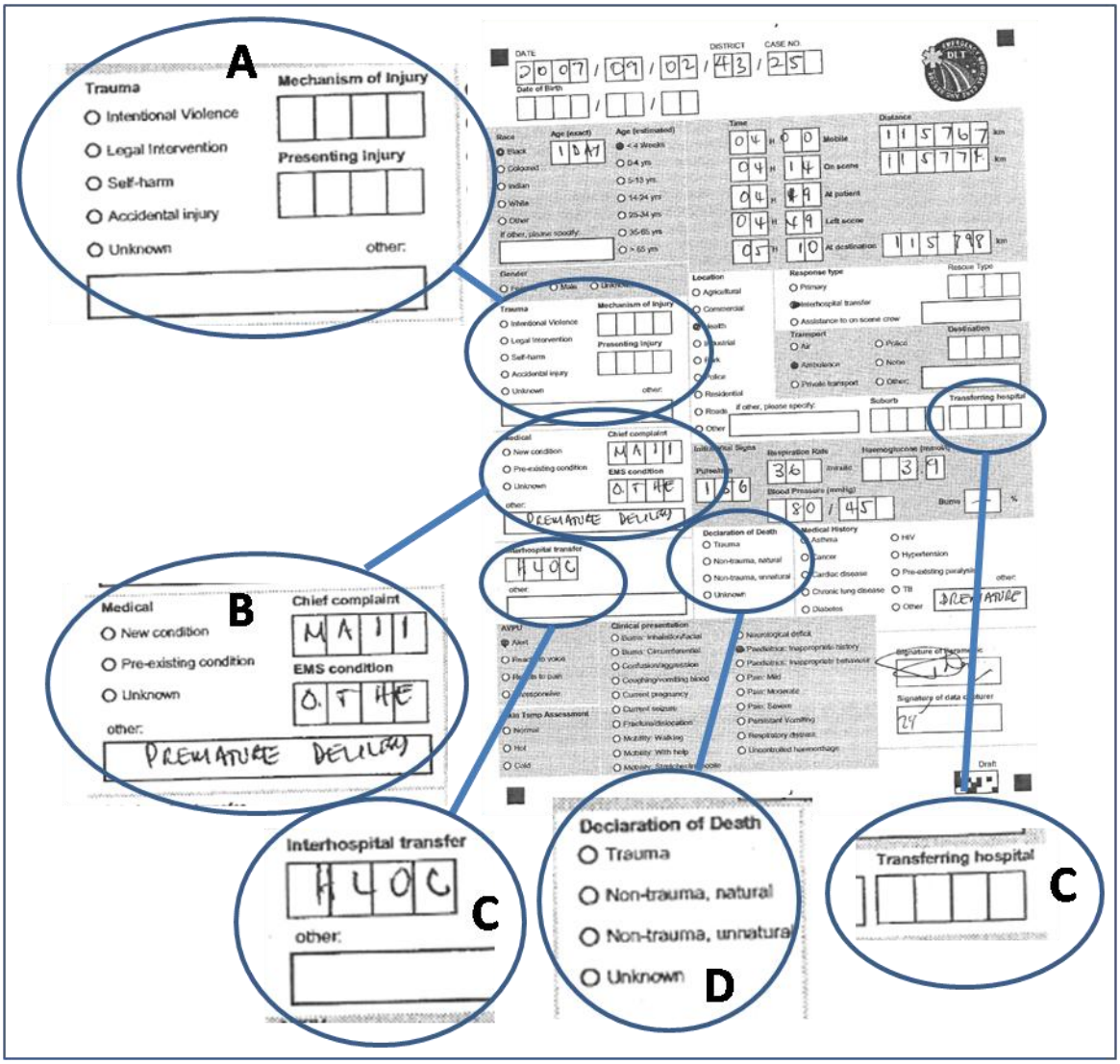


Figure 5.1: Form showing medical, trauma, interhospital transfer and death incident indicators

5.4.1.3. Vital signs and clinical presentation

Specific vital signs and clinical presentations have been found to be important in describing the patient population (section 5.4.4.4). These are the AVPU score, patient mobility, skin thermal condition, heart rate (HR), respiration rate (RR) and

systolic blood pressure (SBP). In a dead patient, with the exception of the skin condition which could be either normal or cool, the AVPU score will always be unresponsive, the patient immobile, and the HR, RR and SBP zero. Further, these clinical features are used in determining patient priority (sections 4.2.2.8 and 5.4.4.4). Thus these elements are not applicable in cases of death (12.08%) and are therefore applicable in only 87.92% of the reviewed records.

5.4.1.4. General location

The general location of the incident describes the geo-political / geo-social area in which we find the patient (i.e. suburb, town, sub-district). While it was indicated in the user instructions that the participants should complete the suburb section for every incident, it was found that there were a number of incidents where the suburb was not recorded if the data on a transferring hospital was recorded. For example, King Edward VIII Hospital is in Ethekwini, radio zone two (the Ethekwini district was divided into radio zones as suburbs). This is obviously logical as the location of the hospital is known; therefore further defining of the area is not really relevant. Thus the suburb was relevant only for those patients not coming from another hospital (80% of cases). Transferring hospitals details were applicable for all interhospital transfers (defined in 5.4.1.2), thus being applicable in 20% of records reviewed.

5.4.2. Irrelevant data elements

The following two data elements were part of the MDS developed. However on analysis and further reflection, are regarded as irrelevant in describing the patient population. "Response" is thought to not be relevant as this is determined by the control centre and is only based on the patient's reported current condition if this condition is known, or able to be elicited, by the emergency call taker. The "diastolic blood pressure" is important for clinical data but is not required for categorising the "patient priority". Therefore, they were not included in the completeness analysis.

In addition, the paramedic's signature is also not a data element required to for characterising the patient population. It was simply requested as this tool, although primarily for research data collection, could be construed to be part of a patient's clinical record and therefore some responsibility for the completion of the form must

be accepted by the participants. Therefore, it was not considered in the completeness analysis.

5.4.3. Data elements not applicable for this study

In this particular trial, the time and mileage at destination were not usable due to the nature of the participants as they were all ECP-A's who operate predominantly on rapid response vehicles, which are not used for patient transport. Thus, unless the patient required ALS escort to hospital, the person collecting the data would not be in a position to record destination mileage. These data elements should remain in the tool for use by ambulance crews in the future.

5.4.4. Combining data elements to define the patient population

As data elements are combined, the raw data becomes meaningful information for characterising the patient population. This is illustrated in the following clustered column charts. The data reflected in the charts is a percentage indication of complete and incomplete data based on applicable records (discussed in section 5.4.1). All percentages have been rounded off to the nearest whole number for the purposes of legibility in the charts; the percentages correct to two decimal places are shown in Table 5.3. The chart organisation is as follows: the data elements are shown in increasing darkness, this occurs as the data elements combine to form a more detailed data element; the patient population descriptor is always shown with a bold boarder. Completed data percentages age shown on the left and incomplete on the right.

As discussed below in this section the aim of describing the patient population is supported by the answers to the five questions: who, when, where, why and how. In this section the researcher will attempt to show both how the data links together and how complete the data were. Grouping of the data elements to produce specific population descriptors was initially proposed in the FGD (sections 3.2.2.6.3 and 4.2.1.1) but only considered in the detail presented below while the researcher was analysing the Phase Three results.

5.4.4.1. Who is the patient population?

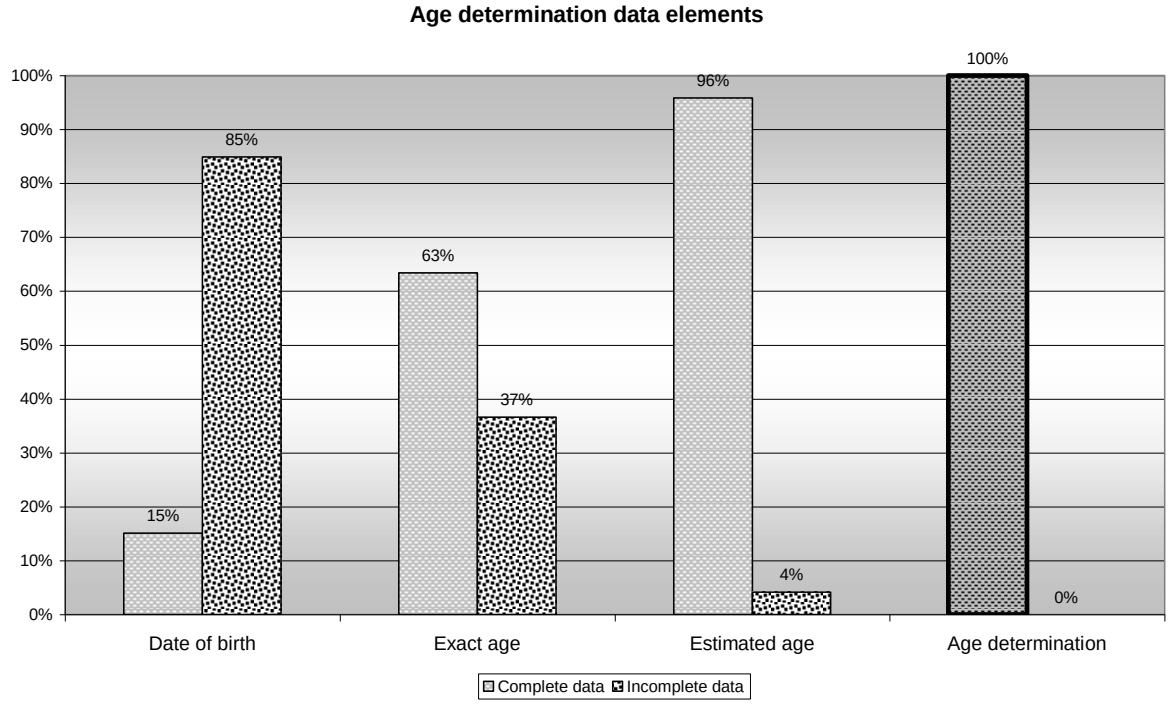


Chart 5.1: Age determination data elements

Age is an essential component in establishing who the patients are from a demographic perspective (Chart 5.2) as well as determining the severity of their clinical conditions (Chart 5.8 and section 5.4.4.4). Records should ideally collect the data in its most raw form; i.e. DOB or exact age. However the results of the record review indicate that in only 15% of cases was the DOB obtained. This figure is a confirmation of the participants' concerns regarding this data element (section 5.3.4). Of further concern, is that barely 63% of records reviewed collected an exact age for the patient. However the data collection is remarkably better for the estimated age element, with a 96% completion in applicable records (5.4.1.1). While the estimated age categories are not an appropriate demographic descriptor for comparing this data with national or international health information (WHO, 2007; KZN-DOH, 2008); they are appropriate for integration with Stats SA data (section 4.2.2.1), and prioritising according to the TEWS system (section 4.2.2.8). Thus, the findings that there was 100% completeness of data elements to determine the patients' ages were welcomed.

These age results have been combined with gender and race (95% and 96% respectively), to produce a composite demographic data sub-set (Chart 5.2). The overall level of completeness for demographic descriptors was 91%.

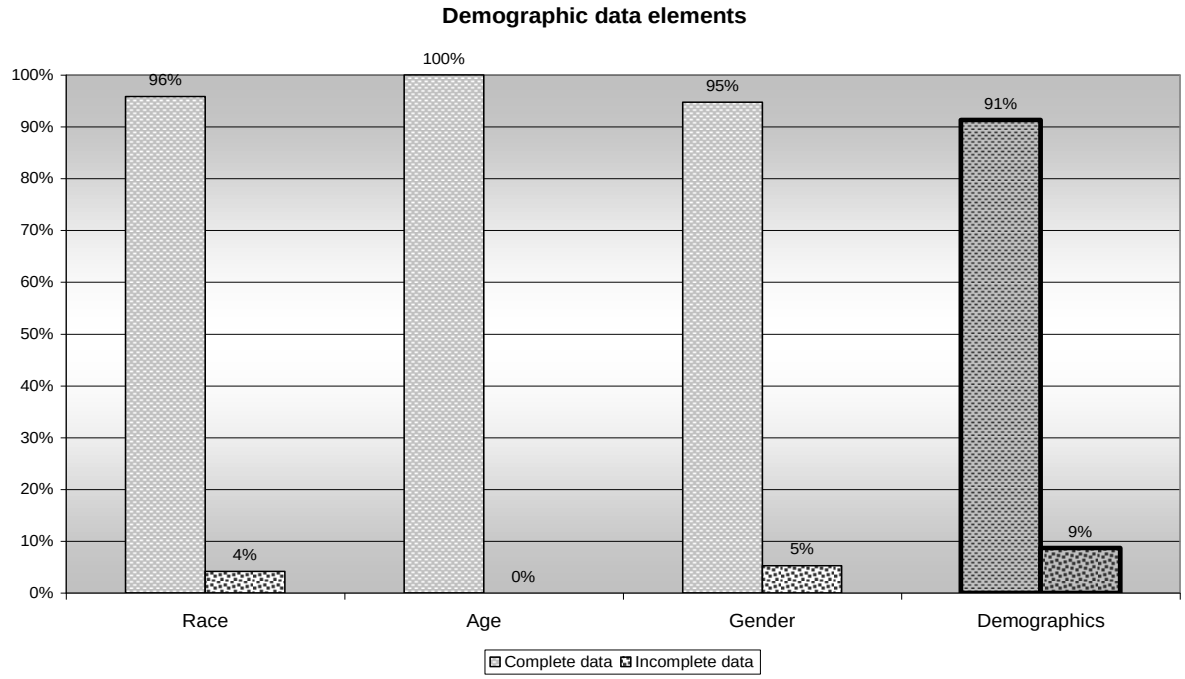


Chart 5.2: Demographic data elements

An essential component of determining who the patient is; is ensuring that continuity of data is available both within and outside the EMS, thus the prehospital records need to be able to be linked to the control centre records and hospital records. This continuity can be maintained by making sure that sufficient data is available to identify the patient. The data elements necessary to achieve this (with control centre records) are date, and case and district numbers; linking pre- and in- hospital data would require names and birth dates (outside the scope of this project). Date and case number were 100% complete, with district number pulling the record identification down to 96% complete.

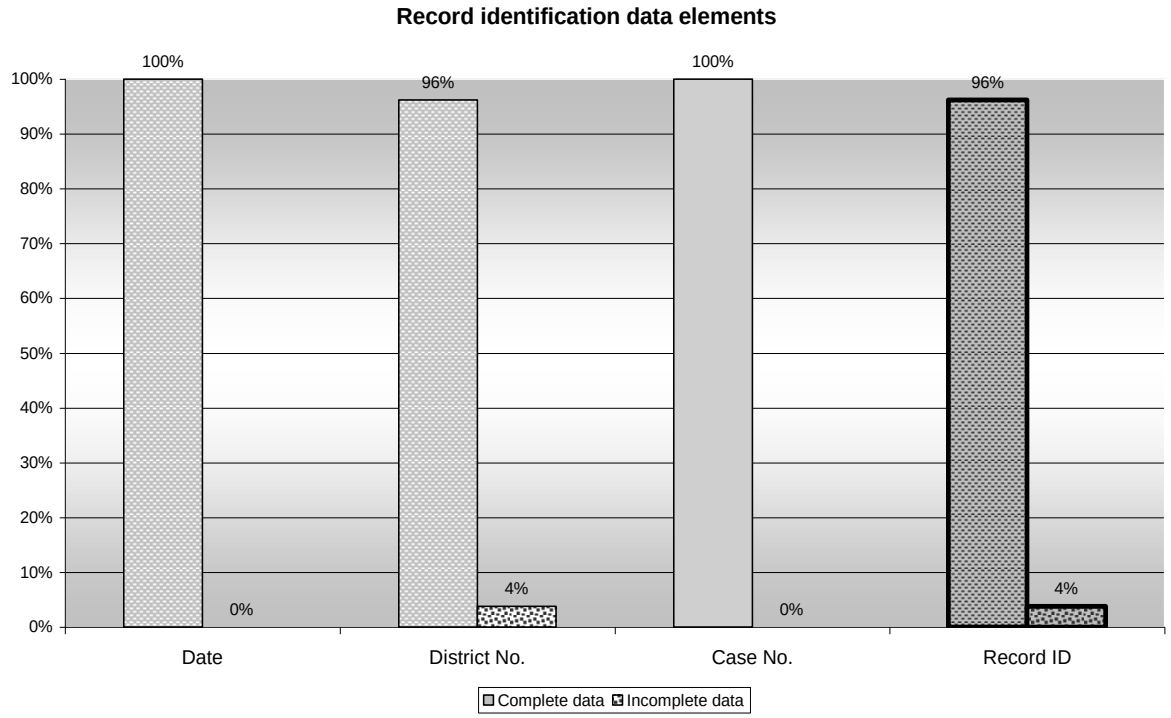


Chart 5.3: Record identification data

5.4.4.2. When are the patients using the EMS?

As shown in Chart 5.4, the times relating to the incident were well collected with completeness ranging between 92% and 99%. These times can supply two types of specific information about the patients: (i) what time of day the EMS is more frequently used; and (ii) what the patients' access to healthcare is in terms of time. Following the researcher's visit to the KZN EMRS control centre, it was recognised that while these times are currently manually collected by the ECP's, they are also collected by the vehicle tracking system. Thus, once the databases within the EMS have been integrated, it would be possible to decrease the amount of data collection required of the ECP's (times could be automatically collected by the control centre, but would remain part of the MDS), thereby allowing more time for patient care and relevant data collection (section 4.2.1.3).

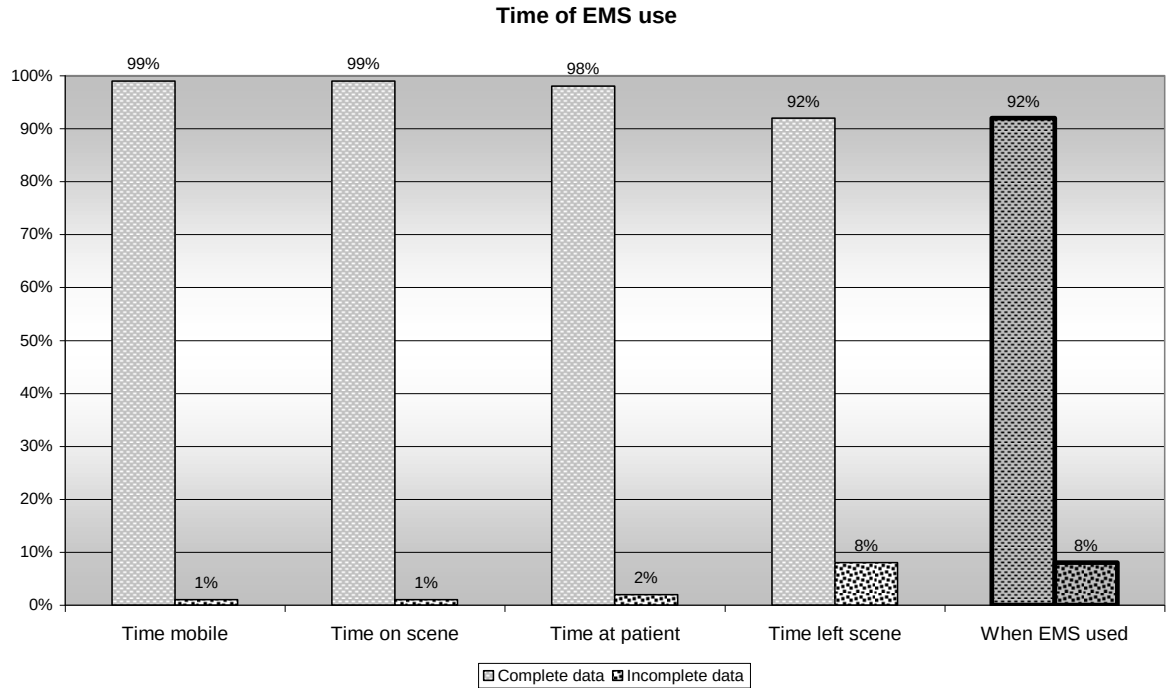


Chart 5.4: Time of EMS use

5.4.4.3. Where is the EMS used?

The location of EMS usage (Chart 5.5) is a composite of a number of data elements. The first under consideration is the mileage, which is a useful data element in determining how far the users of EMS are from health care, important in a socio-political context (DOH, 2000), but is not as relevant as time (in affecting patient outcomes). Two specific factors make time more important than mileage: (i) the condition of the roads and / or presence of traffic can affect prehospital times more than the distance alone; and (ii) distance is very rarely specified in aeromedical transportation and response, flying times are always specified (based on discussion between the researcher and a participant operating within the aeromedical arena). As with time, however, this may not be an essential element for the ECP's to collect as it too is available in electronic format already through vehicle tracking systems, requiring simply an integration of data from databases; however, as with the times, mileage remains part of the MDS regardless who collects it. Nevertheless, collection of this data element was 89% complete (section 5.4.2, Chart 5.5).

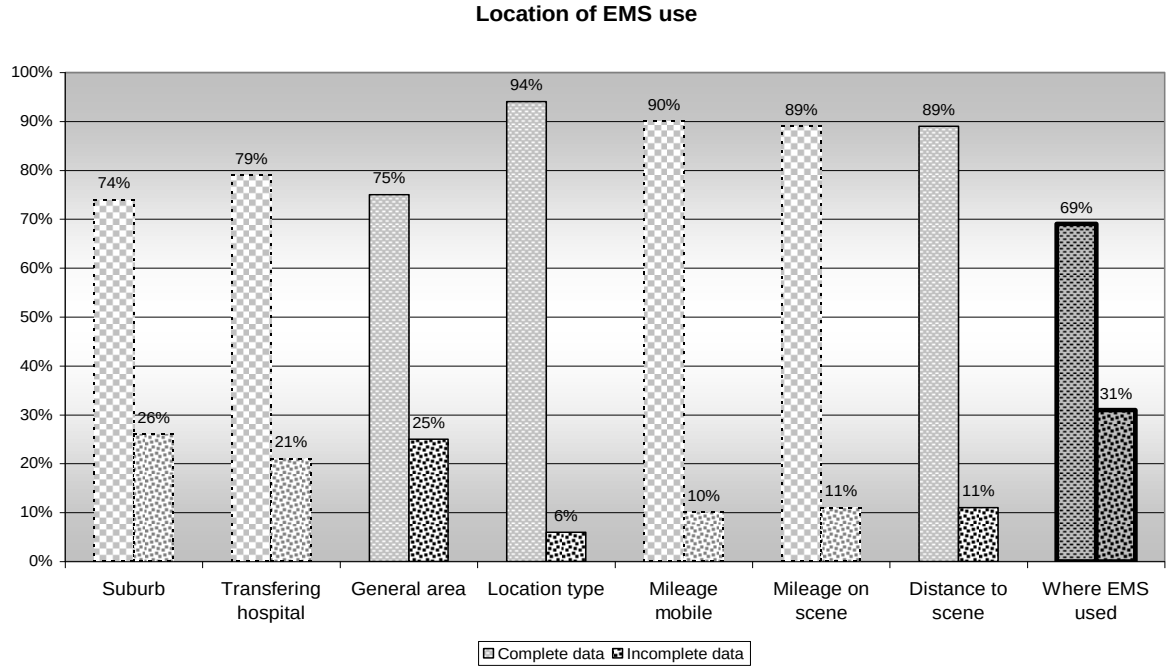


Chart 5.5: Location of EMS use

Chart 5.5 details how the location of use is determined. The mileage is calculated into distance of the patient from health care. The distance of the patient from initial health care (EMS) is the difference between mobile mileage and scene mileage (Chart 5.5); the distance to definitive health care (hospital) is the difference between scene and destination mileage. The suburb and transferring hospital together make a composite element – general area. These composite elements are combined with the patients' specific location type to gain an overall impression of where the EMS is used.

The completion percentages for suburb and transferring hospitals was low (74% and 79% respectively), thus leading to low general location completion (75%). The specific location type, despite concerns raised in section 5.3.2, was completed in 94% of the incidents. Thus if the distance and general area indicators were collected through the control centre it may be possible to achieve better completeness rates. In the case of the records for this study, it could have been 94% as opposed to the 69% that was obtained.

5.4.4.4. Why are the patients using EMS?

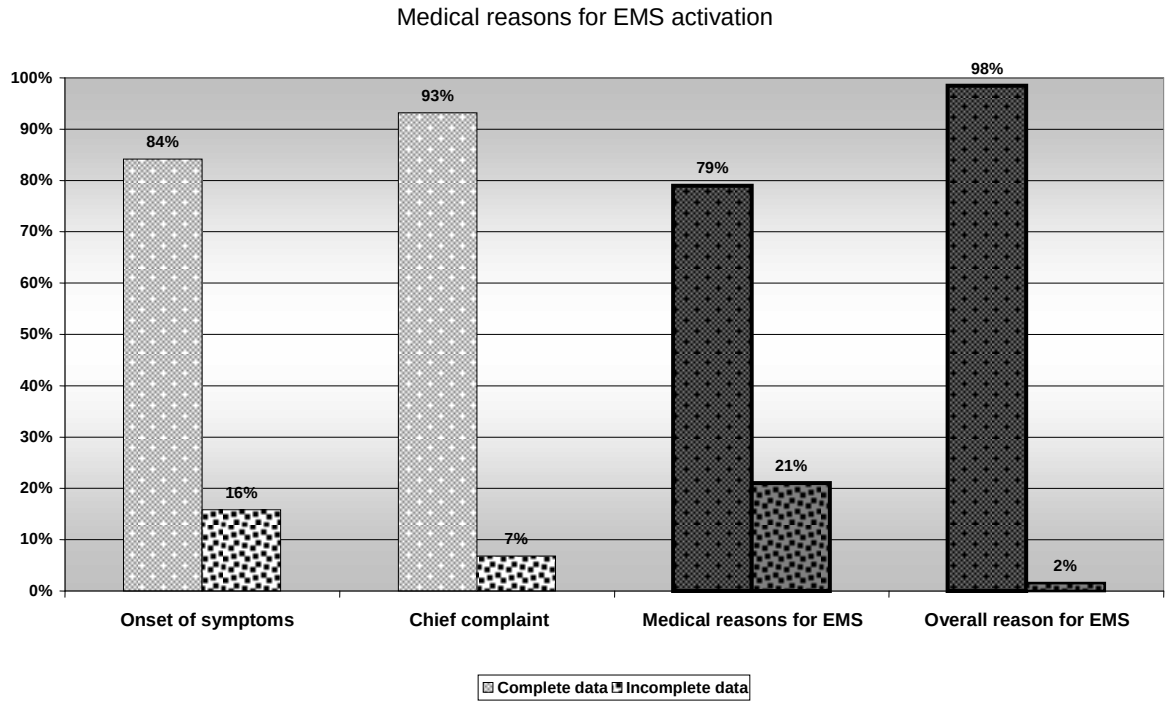


Chart 5.6: Medical reasons for EMS activation

The reasons for EMS usage include the reason that EMS was activated (Charts 5.6, 5.7) and the seriousness of the patients' clinical condition (Charts 5.8 & 5.9). The reason for EMS usage was compiled by using trauma incidents, medical incidents, IHT and declaration of death (5.4.1.2).

The medical reason for activating the EMS is comprised of the onset of symptoms and the patients' chief complaints. Completion percentages of 84% and 93% respectively were obtained, resulting in 79% of required data complete. This is consistent with participants' concerns regarding the definition of new onset versus pre-existing conditions and the lack of codes for specific obstetric and medical emergencies (see sections 5.3.2 and 5.3.3); obviously where confusion exists incompleteness will be more common.

There were fewer concerns shared by the participants recording trauma cases and this is reflected by the completeness percentages: intent of trauma 98%, mechanism of injury 96% and a combined reason for EMS activation in trauma of 94%.

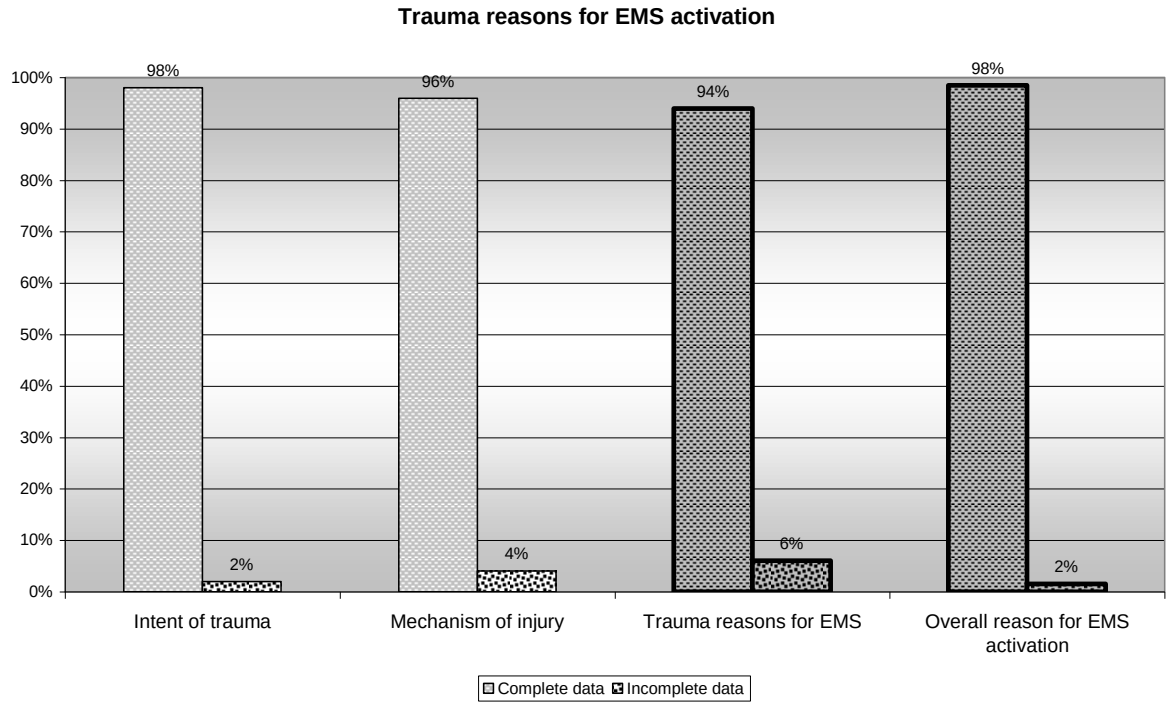


Chart 5.7: Trauma reasons for EMS activation

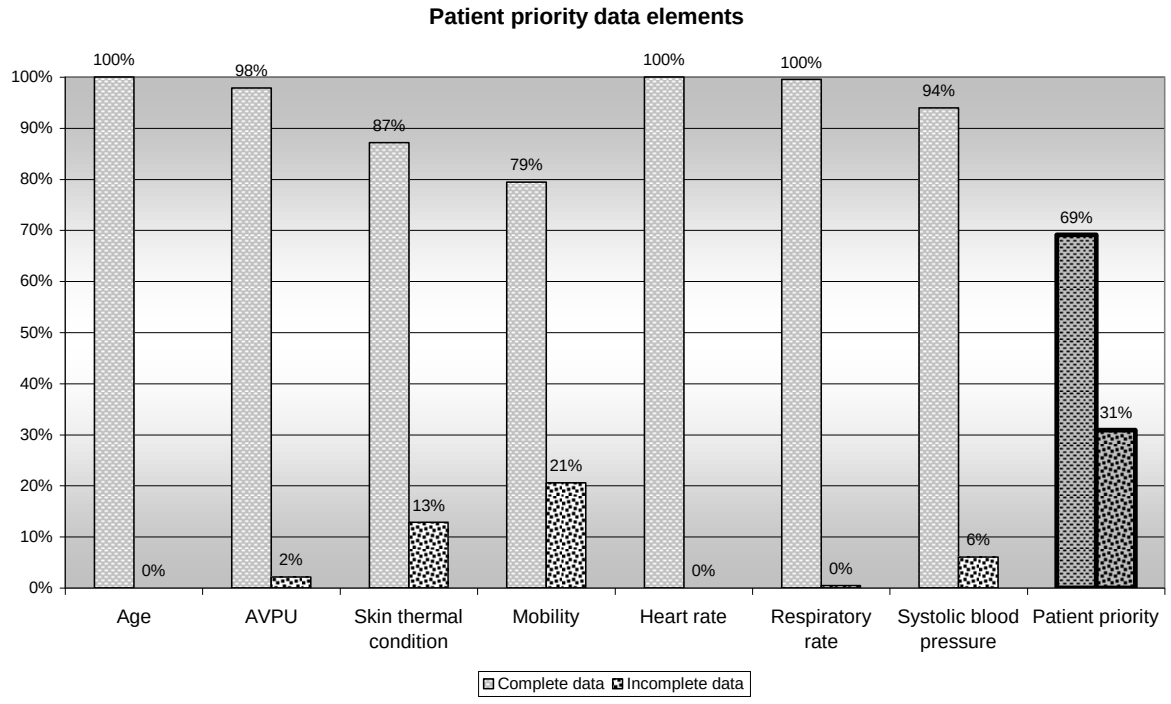


Chart 5.8: Patient priority data elements

Determining a patient's medical priority using an anatomical or physiological score allows a user of health information to gauge the seriousness of the case. As discussed in section 4.2.2.8, the TEWS physiological scoring system was used in

this project. Chart 5.8 is a graphic illustration of the data elements that form the TEWS scoring system. Age is obviously important in classifying the physiological parameters of vital signs as normal or abnormal. Completeness of the individual data elements varied widely, from 100% complete for age, heart rate and respiration rate; through AVPU (98%) and SBP (94%); dropping to 87% and 79% for the skin thermal condition and mobility, respectively, possibly due to the new inclusion (as opposed to previous PRFs) of these last two data elements. The overall completeness rate was only 69%.

While the priority of the patient is an important indicator of the severity of the condition of the patient, it is only one indicator. Chart 5.9 details the completeness of data relating to the clinical condition and its components. To determine the clinical condition, one of the following was required: the presenting injury in a trauma incident, the EMS diagnosis in a medical emergency or the reason for an IHT (90, 92 and 89% complete). These incident data elements are then combined with patient priority (69% complete) to produce a detailed report on the patients' clinical condition (70% complete).

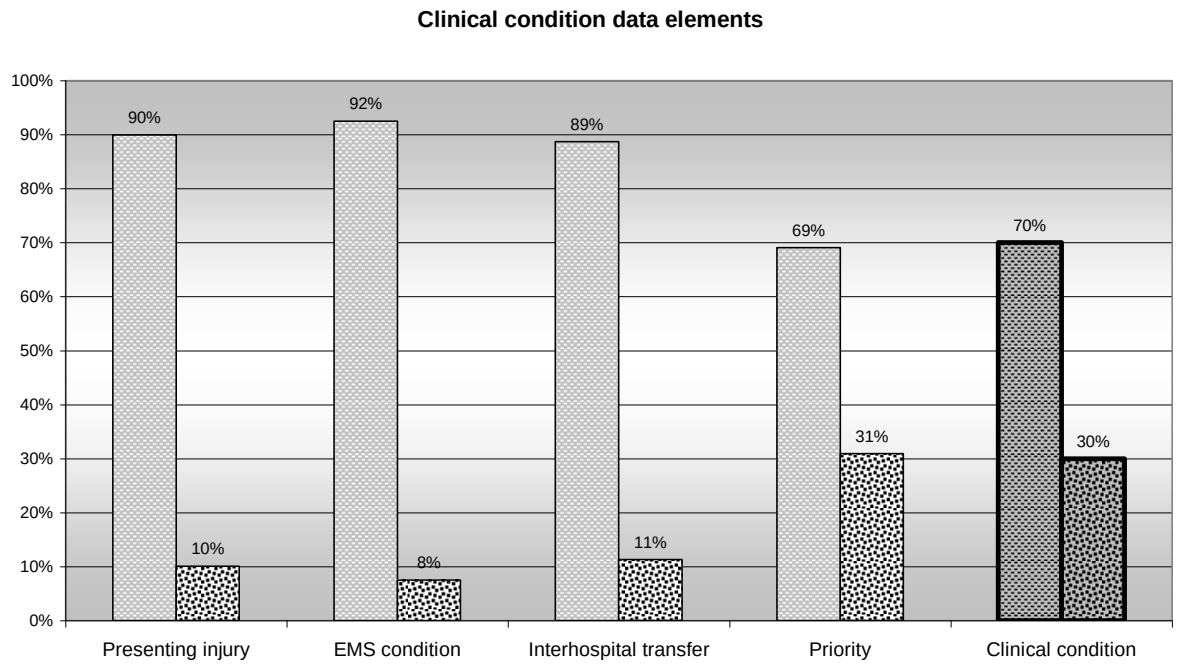


Chart 5.9: Clinical condition data elements

5.4.4.5. How is the EMS being used?

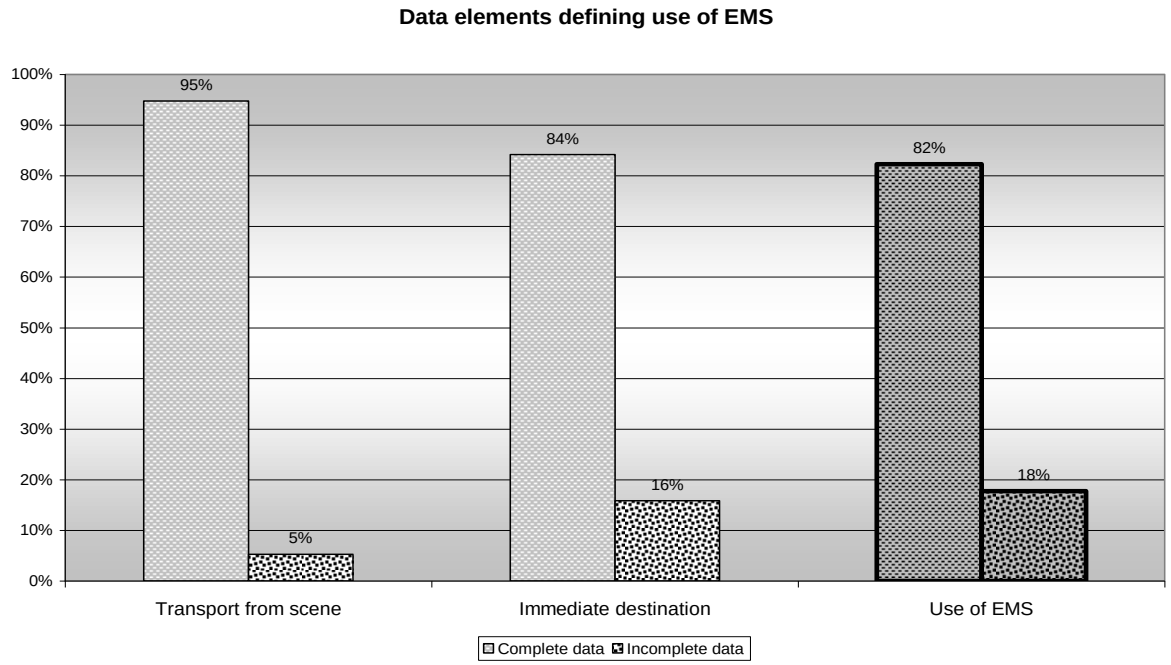


Chart 5.10: EMS use data elements

Transport from the incident and the immediate destination of the patient together indicate how the EMS is used. For example, certain hospitals take only certain types of patients, or patients deemed to be in a particular clinical condition (Engelbrecht, Daviaud, Shaw, Couper and Claassens, 2000; HST, 2003). Furthermore a patient using private transport to leave a scene (at which an ECP was present and may have given treatment), is usually in less serious condition than one travelling by ambulance. By the same token, patients transported by aeromedical services are typically more critically injured or ill than those transported by road. If the destination is a private hospital, this can also indicate the financial or insurance position of the patient. Chart 5.10 shows how the combination of transport and destination affects the completion rate for use of the EMS. Transport was 95% complete, while an immediate destination completion 84%, complete, drove the completeness of the data element “use of EMS” down to 82%.

5.4.4.6. Description of the patient population

The data groups developed to define various aspects of the patient population can be combined to yield a composite view of the patient population using the EMS. Chart 5.11 indicates the completeness of data that was collected from the EMS, using trained, skilled ECP’s. Of interest to note is that the top scorers (above 90%)

tend to describe the patient population quite well. The completeness of the clinical condition could be expected to rise following the addressing of the coding issue raised by the participants (section 5.3).

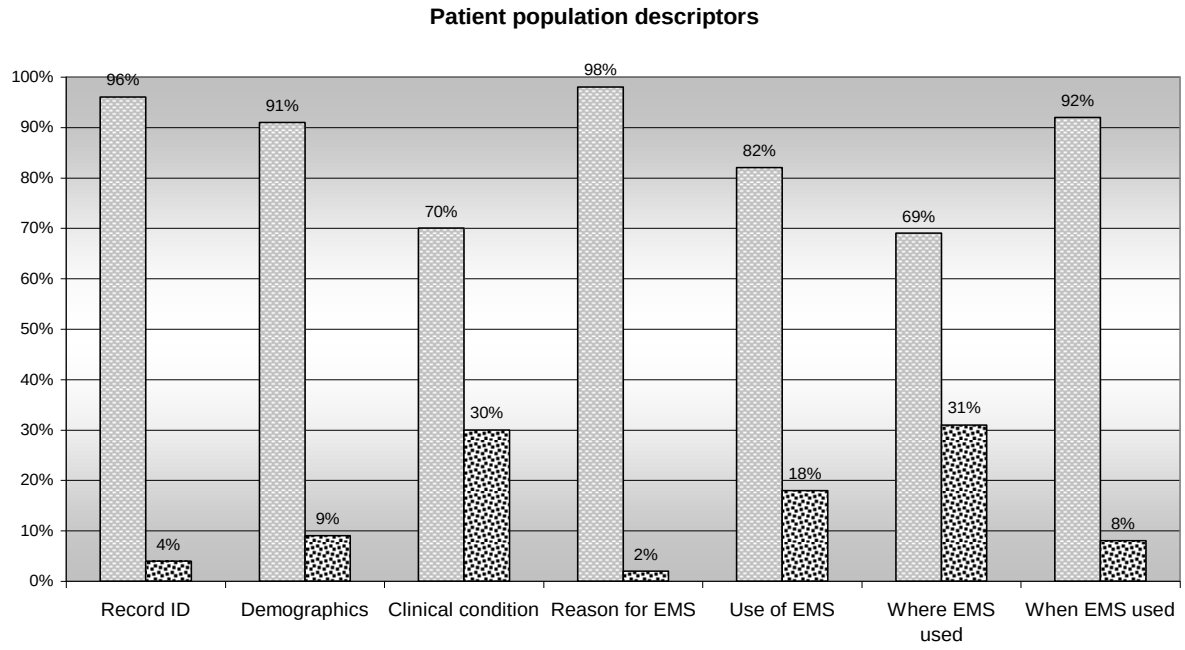


Chart 5.11: Patient population descriptors

5.5. Conclusion

While the first two phases of this study were qualitative only, Phase Three is a mixed method design (section 3.4.2): participant opinion was analysed in a qualitative manner while the evaluation of the completeness of data collection by use of the tool has been subjected to quantitative analysis (Polit and Beck, 2006).

The researcher is content with 90% completion for data elements. Thus the areas of concern are those individual and composite data elements that had completion percentages that were below 90%.

- The “clinical condition” with 70% completion was due to a low completion rate for IHT reasons (89%) and “patient priority” (69%), which resulted from the low completion rate for “skin thermal assessment” (87%), and “mobility” assessment (79%).
- “Use of EMS” was 82% complete as “destination” was poorly completed (84%). A more detailed record review revealed that the destination was commonly left out when no EMS transport occurred.

- Determining where the EMS was used was only complete in 69% of records reviewed. This poor result can be attributed to poor collection of suburb and transferring hospital data (74 and 79%), and less than ideal mileage collections (89% for on scene odometer reading). This is not of great concern in that the aeromedical services (one participant) do not log mileage, and this data can be easily obtained through linking of data sources – specifically vehicle tracking systems.
- The medical reason for use of the EMS was poor at 79% complete, with much of the incompletion being due to an 84% completion of the onset of symptoms for the medical condition.
- In the age category the DOB had only a 15% completion and exact age 63%; however with the estimated age included, complete age data was obtained for 100% of patients.
- Low completion rates, across all data elements, may also be related to the usual data collection method of using free text as opposed to the tick box and code system used in this study.

This phase of the research did not, however, only reveal poor results. 28 data elements, sub-elements and composite elements had an acceptable completion rate of over 90%. From this one can gain valuable data regarding the patient population using the EMS. Where poor completion results were obtained, reasons have been identified from the participant comment and recommendations for improvement be discussed in sections 6.2 and 6.3. Furthermore this phase of the research has shown that the tool is user friendly and easy to complete.

CHAPTER SIX: Conclusion and recommendations

6.1. Conclusion

6.1.1. Development process

As introduced in section 1.2 and expounded on in Chapter Two the researcher identified that prehospital data collection, in South Africa, is haphazard in coverage of the patient population and is not conducted in a manner for easy and sustainable data capture and use. The importance of EMS data as an essential part of health information cannot be over emphasised (Brokaw et al., 1998; Downing et al., 2005).

With this in mind the researcher set out to develop a tool that could be used in the description of the patient population using the EMS. A three phase methodological study was used; combining both qualitative and quantitative investigation and analysis; to develop a MDS for patient population description and test the tool in an authentic environment for ease and appropriateness of use. This project involved EMS experts and practitioners in both the development and testing of the tool.

In the first phase of the research experts assisted the researcher in developing a MDS to define the patient population. This assistance took the form of a FGD followed by a four round Delphi study. The result of this phase was the identification of the minimum data required to form a composite depiction of the patient population, and the preferred method of data collection. The second phase was essentially a pilot study for the third phase. In this phase (the second) the researcher worked with EMS practitioners and form development professionals to develop a user-friendly, understandable tool and user instructions to collect the minimum data required. Phase Three of the research was field testing of the tool in an authentic environment, for usability, with the participation of experienced EMS practitioners. Some recommendations following Phase Three are presented in section 6.2.

Overall this research project appears to have been successful in achieving its purpose. An MDS containing the data elements required to describe the patient population has been developed and accepted by a group of EMS experts. In section 2.7.7.1 eight criteria were given on which to judge data elements for inclusion into

the MDS (Durch and Lohr, 1993; Thompson and Schaffer, 2002). These criteria are listed, in Table 6.1, and related with the findings of this project.

Table 6.1: Criteria for inclusion into the MDS

Inclusion criteria for data into the MDS	Comment
Specific, identifiable purpose	Section 5.4.4 shows how the data elements can be combined to describe the patient population demographically, clinically, and by their use of the EMS. Section 5.4.2 lists only two irrelevant data elements
Relevant at all levels of collection	Based on Phases Two and Three it is assumed that the data collection tool can function as a PRF for EMS crew notes (handover at hospital) and for hospital use (continuation of care), and can be used by all levels of EMS personnel; this would need to be tested further to confirm (section 6.2)
Be able to be aggregated and coded	Section 5.4.4 and Table 5.3 show how the data can be aggregated and coded
Routine collection	The results of Phase Three (section 5.3) suggest that it would be easy to implement for routine use with adjustments for specific services (section 4.2.1.2).
Easy to collect	As discussed in section 5.3 and shown by the completion rate (Table 5.3) the data is easy to collect.
Reasonable cost	Implementing Phase Three required only printed forms, further implementation (section 6.2) may require the use of printed forms and a document scanner or data capturer, but does not rely on expensive technology.
Tracking of individuals possible	Individuals can be tracked via their date, district and case number (section 5.4.4.1 and Chart 5.3).
Not be primarily judgemental	The potentially judgement criteria that were not directly related to the patient population were removed early during Phase One (Table 4.1)

It was also noticed by the researcher that the participants may be amenable to a change in their usual patient data collection methods, thus making this type of data collection a possible reality (section 5.3).

6.1.2. The tool for describing the patient population

Table 6.2 lists the final MDS that has been produced for the description of the patient population. Also included in this table are the data collection methods for each data element; ready for further research (section 6.3). As discussed in section 5.4.4 the data elements need to be grouped together to produce specific description about the patient population; these groupings are shown in Table 6.3.

Table 6.2: Data elements and collection methods

Data Element	Collection method
Date	Numerical boxes
District no.	Numerical boxes
Case no.	Numerical boxes
Date of Birth	Numerical boxes
Race	Tick boxes / Free text (other)
Exact age	Numerical boxes
Estimated age	Tick boxes
Gender	Tick boxes / Free text (other)
Intent of trauma	Tick boxes
Mechanism of injury	Alphanumerical code / Free text (other)
Presenting injury	Alphanumerical code / Free text (other)
Onset of medical complaint	Tick boxes
Chief complaint	Alphanumerical code / Free text (other)
EMS condition	Alphanumerical code / Free text (other)
Interhospital transfer	Alphanumerical code / Free text (other)
Declaration of death	Tick boxes
AVPU	Tick boxes
Skin thermal condition	Tick boxes
Mobility	Tick boxes
Time mobile	Numerical boxes
Time on scene	Numerical boxes
Time at patient	Numerical boxes
Time left scene	Numerical boxes
Time at destination†	Numerical boxes
Mileage mobile	Numerical boxes
Mileage at scene	Numerical boxes
Mileage at destination†	Numerical boxes
Location	Tick boxes
Suburb	Alphanumerical code / Free text (other)
Transferring hospital	Alphanumerical code / Free text (other)
Response*	Tick boxes
Transport	Tick boxes
Destination	Alphanumerical code
Pulse	Numerical boxes
Respiration	Numerical boxes
Systolic blood pressure	Numerical boxes
Diastolic blood pressure*	Numerical boxes
Paramedic signature†	Free text

Table 6.3: Data elements for population description

Population descriptor	Data Elements
Demographic s	Race Gender Age (estimated age, exact age, date of birth)
Record identification	Date District number Case number
Time of EMS use	Time mobile Time on scene Time at patient Time left scene Time at destination
Location of EMS use	Suburb Transferring hospital Location type Mileage mobile Mileage on scene Mileage to destination
Reasons for EMS activation	Onset of symptoms Chief complaint Intent of trauma Mechanism of injury Reason for interhospital transfer Declaration of death
Clinical priority	Age (as detailed above) AVPU Skin thermal condition Mobility Respiratory rate Systolic blood pressure
Clinical condition	Presenting injury EMS condition Clinical priority (as detailed above)
Use of EMS	Transport Destination

6.2. Recommendations

Phase One of the study was adequate for addressing the research problem – the need to develop a tool to define the patient population using the EMS in South Africa. However, the third phase could be considered as an initial testing since it was only tested in KwaZulu-Natal, in the public sector, with ECP-A's. It was essentially a pilot project to assess the use of the tool in the authentic environment. Therefore, it needs to be more widely tested to determine its acceptability for use in South Africa

as a whole. Further research is required with the tool, across the country in both public and private sectors.

As discussed in section 5.5, a number of individual and composite data elements had less than 90% completion rates. Based on the analysis of current South African EMS PRFs and the researcher's personal experience in the EMS, it must be noted that some of these incomplete data elements ("skin thermal assessment"; "mobility"; "date of birth"; and "destination" when EMS is not used) were data elements that are not usually collected. Another possible reason for incomplete data was that some data was traditionally collected in free text (section 5.5). Thus the researcher is of the opinion that a need for better education of those completing the form exists, and that the training in the use of the form be revised.

The poor completion percentages for the "use of EMS" composite dataset could be rectified with correlation between navigation and tracking software (available in most vehicles) and the EMS database. The linking of data sources is important in health research, therefore this should problem should not exist in a fully functional system; it may be wise to consider some research into the effective linking of different data collection tools and databases.

6.3. Future study

The researcher has identified a number of areas with potential for further study as a result of this research project. As mentioned in section 6.2, further testing of this tool in terms of acceptability in all EMS in South Africa is required; as is evaluation of the reliability and validity of the tool prior to the logical "next step": implementing the tool for characterisation of the EMS patient population. As the form used in Phase Three was designed for ADE, during this additional testing manual and automatic data capture could be compared as a move toward the establishment of sustainable databases (sections 1.8 and 3.4.1).

Further study is required in classification and coding of data elements to make the selections more "natural" (section 5.3.2) and to be user friendly to the primary collectors (section 5.3.3). This should be coupled with refinement of and education in

the user instructions. As discussed in section 4.2.2.7 further study in “EMS conditions” would be beneficial in accurately and clearly coding patients’ prehospital “diagnoses”.

Other research ideas are those considered in Chapter One: EMS data is required on a number of key areas (e.g. resource allocation, budgets, clinical governance and continuing professional development) within the industry, and thus research into the identification and collection of data in other areas could be considered, including the application of this method to other data sets in EMS data needs. Furthermore with the current tool, a correlation of prehospital and in hospital diagnoses could be used to assess both paramedic proficiency and allow for establishment of accuracy reports, thus highlighting areas of competence or need for further training and education.

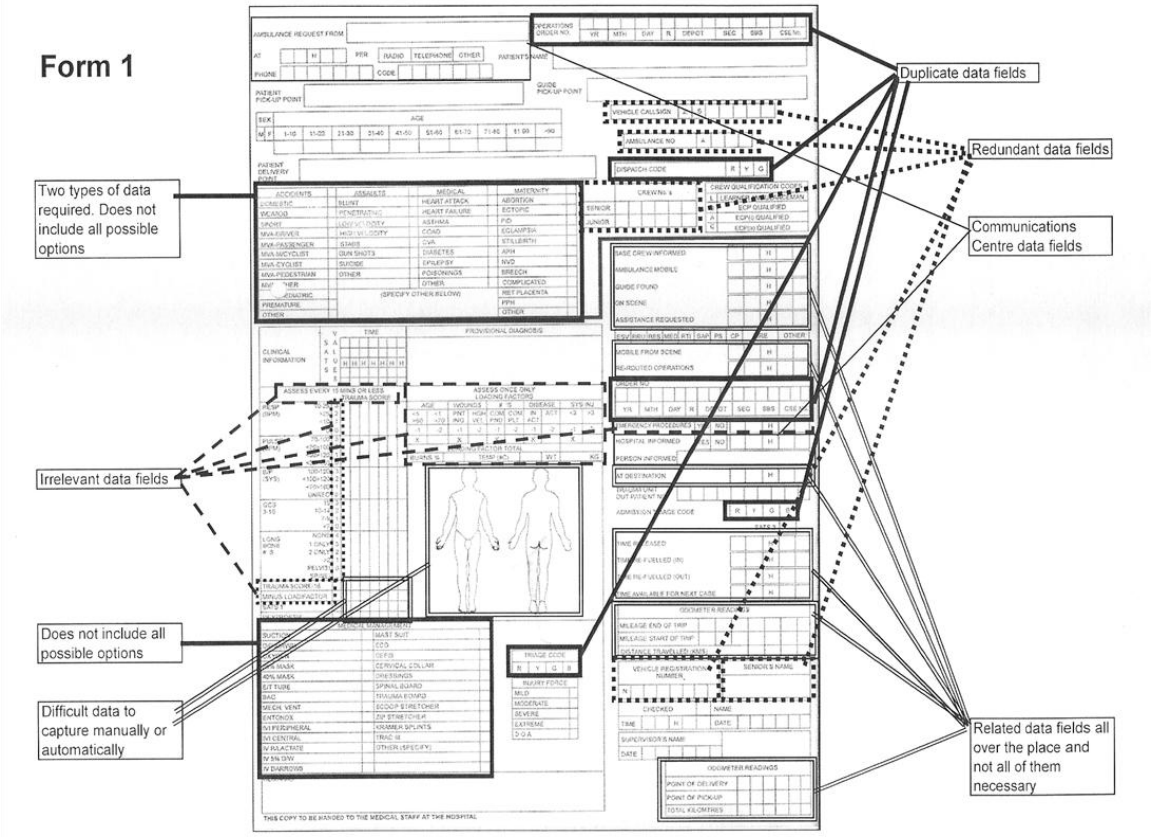
6.4. Closing statement

As discussed in Chapter One, Brokaw et al. (1998) and Downing et al. (2005) are of the view that prehospital EMS data is essential in developing an accurate description of community health and obtaining individual patient conditions prior to arrival at hospital. However, in an editorial Callaham (1997: 787) notes a disturbing fact: “*there is more solid scientific information about topics such as herbal medicine, acupuncture, hives, and constipation than there is about the entire practice of EMS.”* Thus it is essential not only that EMS research is conducted, but that it is directed where it will be most appropriate – benefiting the patients; therefore the need to know who the patients are is crucial.

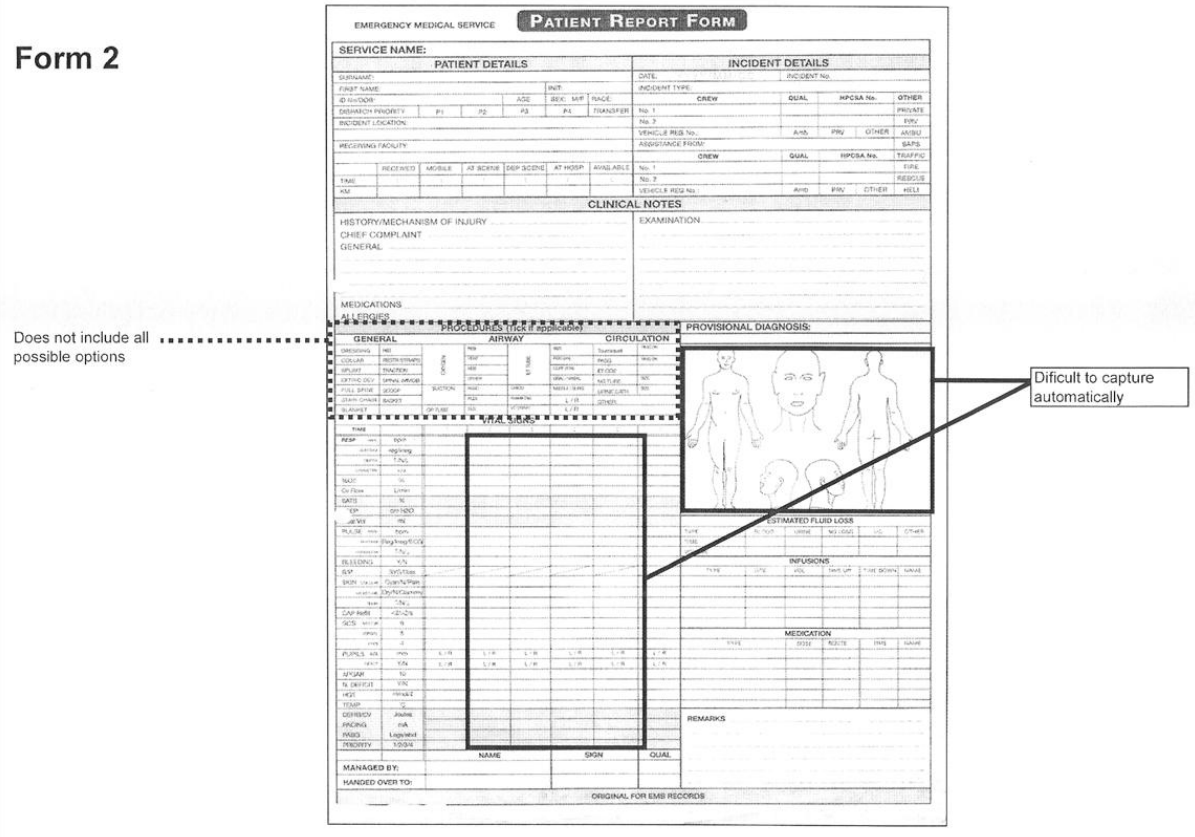
LIST OF APPENDICES

APPENDIX A: PRFS 1 to 5

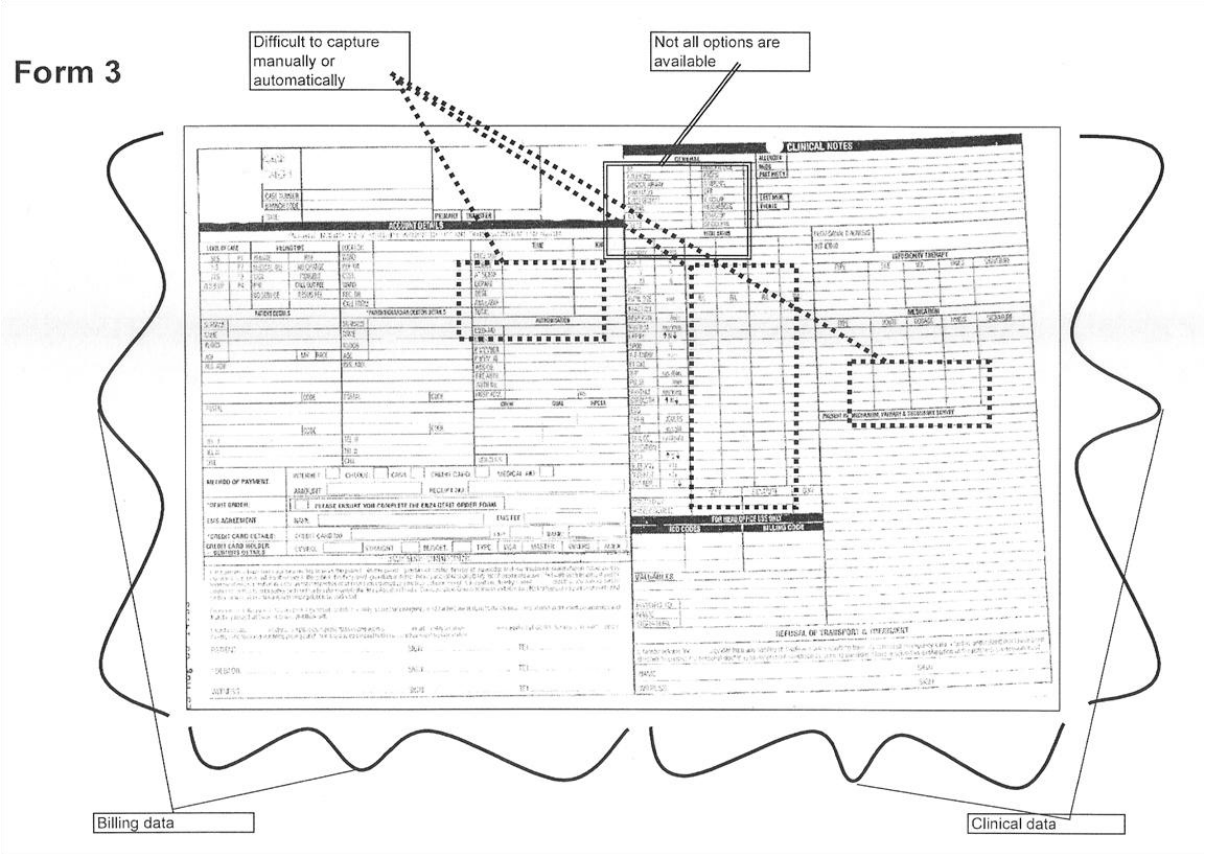
Form 1



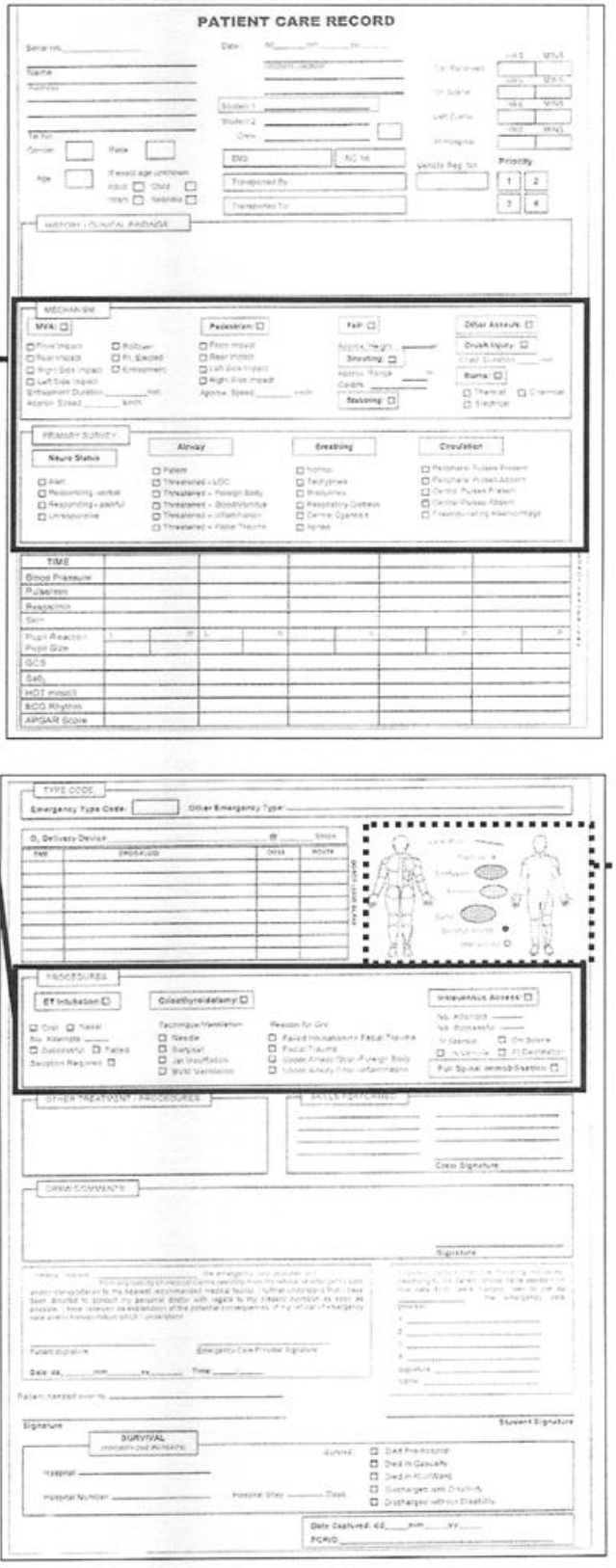
Form 2



Form 3


Difficult to capture manually or automatically
Not all options are available
CLINICAL NOTES
Billing data
Clinical data

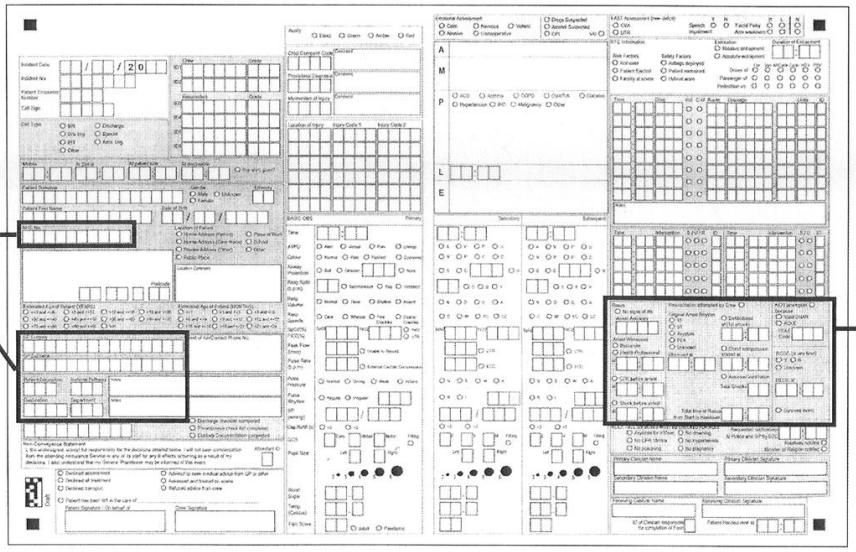
Form 4



Not all possible options available

Difficult to capture manually or automatically

Form 5



Appendix B

Information letter: Expert group: Focus group discussion

A project entitled: *Development of a tool to define the population of emergency medical care users,* is being undertaken by myself in order to complete a Master's Degree in Technology in the Department of Emergency Medical Care and Rescue at the Durban Institute of Technology. This will involve the development and testing of a patient report form to collect data to define the patient population using the prehospital emergency medical services (EMS).

Experts will be requested to assist:

1. Determining what we need to know about our patients in order to describe them (this may include demographics, diagnosis, severity, etc);
2. What the minimum data is that we need to collect to answer the questions and describe the patients; and
3. Deciding what other data must be collected by a EMS patient report form to meet the audit, clinical, legal, management and billing requirements of an EMS.

Objectives 1 and 2 will be met by participation in a focus group followed by email discussion. Objective 3 will be met by email discussion only.

The focus group will be held at the Durban Institute of Technology on a date mutually acceptable to the participants. The group will consist of no more than 8 – 12 participants and will run for approximately two hours. Following the focus group the ideas developed will be disseminated via the email for further discussion and development of ideas. The email group will consist of the focus group and additional

15 – 30 participants. Four rounds of email discussion will take place over an eight-week period.

The focus group will be recorded, both voice recording and by means of a scribe, for later analysis. The recording will not be made available as part of the study, only the ideas developed. All participants will be required to sign a confidentiality agreement with specific emphasis on protecting the privacy of the individuals participating in the focus group. No comments will be attributable to any one particular participant.

All emails in the discussion group will be between participant and researcher, no group emails. Discussion will be collated from each round and sent to the participants in the following round. Again no comments will be attributable to any one particular participant.

As an expert I am asking you to participate in a focus group discussion. By participating in this research you, as an expert in the South African EMS, are assisting in determining accurately who the users of the EMS are. This will allow for, amongst others, better resource allocation, determination of appropriate resource utilisation, and appropriate education and research. You are requested to participate of your own free will and are free to withdraw at any time, without reason, from the project. Following the study you are entitled to a report.

Please confirm via email to jamesb@dit.ac.za, by [date] if you are able to be part of the focus group and / or the email discussion group. If you have any questions please do not hesitate to ask, either the researcher at the above email address or on 072 1145 129 or 031 308 5203, or the research supervisor, Professor L Grainger, at lindag@dit.ac.za or 031 308 5203.

Thank you

_____
James Bowen
Researcher

Appendix C

Informed consent form
(To be completed in duplicate by the participant)

Title of research project:
Development of a tool to define the population of emergency medical care users in South Africa

Name of researcher:	James Bowen	031 308 5203
Name of supervisor:	Dr L Grainger (PhD)	031 308 5203
Name of institution:	Durban Institute of Technology	

Date: __/___/_____

Please circle the appropriate answer

1. Have you read the information sheet? YES/NO
2. Have you had the opportunity to ask questions regarding the study? YES/NO
3. Have you received satisfactory answers to your questions? YES/NO
4. Have you had the opportunity to discuss this study? YES/NO
5. Have you received enough information about this study? YES/NO
6. Who have you spoken to regarding this study? _____
7. Do you understand the implications of your involvement in the study? YES/NO
8. Do you understand that you are free to withdraw from this study at any time, and without having to give reasons for withdrawing YES/NO
9. Do you agree to voluntarily participate in this study? YES/NO

If you have answered "**NO**" to any of the above questions please obtain the information before signing.

Participant _____ Signature: _____

Witness: _____ Signature: _____

Researcher: _____ Signature: _____

Supervisor: _____ Signature: _____

Appendix D

Confidentiality Statement
(To be read and completed by every member participating in the focus group)

Title of research project:
Development of a tool to define the population of emergency medical care users in South Africa

Name of researcher: James Bowen
Name of supervisor: Dr L Grainger (PhD)
Name of institution: Durban Institute of Technology

Declaration – As a member of this focus group I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. The recorded discussion will be transcribed in a manner to keep the participants anonymous in the research process.
3. None of the information shall be communicated to any other individual or organisation outside of this specific focus group.
4. The information from this focus group will be made public in terms of journal publications and research reports, which will in no way identify any participants of this research.

Member's full name	Occupation	Signature	Contact number

Appendix E: Delphi Rounds One to Four

Delphi Round One

Thank you for agreeing to participate in this research project.

Consent, confidentiality, ethics and reporting

- All discussion is anonymous to everyone except the researcher and he is ethically obliged to maintain that confidentiality.
- By participating in this project you are giving informed and voluntary consent to your participation; you are free to withdraw yourself or your comments at any time during this study.
- This research project has received ethical approval from the Durban University of Technology's Institutional Research Committee.
- Following the completion of the research project a full report will be made available to all participants.
- Please find attached an abridged proposal. A full proposal and proof of ethical approval is available on request.

Background

Health systems need information regarding the population that are using the services provided; the emergency medical services (EMS) are no different. This information can be used across a broad spectrum – politicians and strategic managers to gauge equitable service delivery, operational managers to assess appropriate use of resources, educators to revise curriculum and researchers to target specific areas of need. It is apparent that we in South Africa do no know, with a few exceptions, the population using the EMS.

Aims

- The aim of this research is to develop a patient report form (PRF) that collects the data to describe the characteristics of the EMS patient population while still meeting the clinical, legal, financial and administrative requirements of the services.
- The purpose of this email discussion, in which you are participating, is to come to a consensus on what data should be collected to reach the aims.

Research progress to this point

- A focus group of eight EMS experts has met to discuss the data requirements for defining the patient population using the EMS.
- A list has been developed, based on an analysis of existing PRFs, of what data must be collected to meet the administrative needs of the services.

Requirements of participants in this project

Study the proposed list of data to be collected on the PRF and make comments on:

- Any data that should not be collected (removed from the list); give reasons;
- Any data that are very difficult / impossible to collect accurately;
- Any data that should be collected but that is not on the list; and
- Any other ideas / thoughts about capturing the required data.

Send any comments back to the researcher within 10 days. This same procedure will be repeated but with the comments of the entire group added in.

Proposed data list

1. Personal
    - Name
    - Identity number
    - Date of birth / age / age group
    - Residential address
    - Type of housing – e.g.: flat, house, informal settlement
    - Race
    - Gender
2. Financial
    - Medical Aid
    - Guarantor details
    - Medical aid authorisation number
    - Credit card details
    - Payment method
    - Postal address
    - Employment details
3. Administrative
    - Times of case: response, guide picked-up, on scene, departed, hospital informed, destination, refuelling; available,
    - Mileage of case response, scene, destination, available
    - Vehicle identification: fleet / registration numbers
    - Crew names
    - HPCSA and staff numbers
    - Case number
    - Response type: primary, assistance or transfer
    - Incident location
    - Receiving hospital
    - Name of person informed of ambulance on route
    - Assistance required from other EMS crew
    - Location of guide
    - Incident type
    - Control centre data: caller's name, telephone number and time of request
    - ICD-10 code for diagnosis
4. Clinical
    - Patient priority – priority 1,2,3,4 / red, yellow, green, blue
    - Procedures done / interventions performed
    - Interventions attempted
    - Equipment / stock used
    - Medical history
        - Medications
        - Events preceding illness
        - Recent travel history
    - Vital signs: GCS; pupil size and reaction; respiration rate, rhythm and depth; SpO_2; air entry; $EtCO_2$; BP; pulse rate, rhythm and strength; ECG; HGT; capillary refill; APGAR; trauma score
    - Loading factors
    - Skin condition

- Bleeding
- Neurological defect
- Defibrillation and other electrical therapy
- Intravenous infusions: fluid type, site; volume; time of set up
- Medications administered: type; route; dosage; time administered
- Present history
- Detailed mechanism of injury
- Primary and secondary survey findings
- Estimated fluid loss
- Burns estimation
- Provisional diagnosis – “EMS condition” versus ICD-10 coding
- Mechanism of injury
- Findings on scene
- Settings of ventilators and infusions
- Chief complaint
- Level of care provided – based on procedures performed rather than staff present

5. Legal
    - Patient or guardian signature
    - Level of health care provider
    - Valuables
    - Handover signature
    - Crew signature

Request for higher level of care

- Supervisor signature
- Refusal of transport / treatment clause and signature

Delphi Round Two

SECOND ROUND OF EMS EXPERT EMAIL DISCUSSION

Thank you for your comments in the first round. Those who did not participate in the first round are still requested to participate in this and the next two rounds of the study.

Information pertaining to the background of this study and issues on consent, confidentiality, ethics and reporting was given in the first round of the study, as was a copy of the abridged proposal. Should you require this information or a copy of either the full or abridged proposal, please contact me.

Purpose of the EMS expert email discussion group

Based on feedback from the first round, there is a significant change to the purpose for this email discussion group of EMS experts. The purpose of whole research project is to develop a minimum data set to describe the characteristics of the EMS patient population. Ultimately (but not during this study) this data set should be able to be integrated into the patient report forms of all EMS in South Africa; electronic or paper, private or public, ground or air. Integration of this data will allow for an in-depth description of the EMS patient population. **The purpose of this email discussion**, in which you are participating, **is to come to a consensus on what data should be collected to define the patient population**.

Research progress to this point

- A focus group of eight EMS experts has met to discuss the data requirements for defining the patient population using the EMS.
- A list has been developed, based on an analysis of existing PRFs, of other data that may assist in defining the patient population.
- One round of the EMS expert email discussion has taken place

Requirements of participants in this project

Study the proposed list of data to be collected to determine the EMS patient population and make comments on:

- Any data that should not be collected (removed from the list), give reasons;
- Any data that is very difficult / impossible to collect accurately, suggest ways for the difficult data to be collected if possible;
- Any data that should be collected but that is not on the list; and
- Any other ideas / thoughts about capturing the required data.

Please send any comments back to the researcher within 10 days. This same procedure will be repeated but with the comments of the entire group added in.

Based on literature studied, the proposed definition of the population of patients using the EMS could be classified under the following headings:

1. Demographics
2. Reason for calling;
3. On scene diagnosis; and
4. Severity of the clinical condition

Please comment on these headings.

Proposed data list (COMMENTS FROM THE FIRST ROUND ARE IN CAPITALS)

1. Demographic
    - Age / age group
    - Residential area
    - Type of housing – e.g.: flat, house, informal settlement

        - "TYPE OF HOUSING. I HAVEN'T SEEN THE MOTIVATION FOR HAVING THIS IN THE DATASET (I'VE PROBABLY MISSED SOMETHING), BUT I CAN'T THINK OF ANY REALLY GOOD REASON TO HAVE IT THERE. I KNOW YOU'RE TRYING TO DESCRIBE A POPULATION, BUT IF YOU INCLUDE THIS THEN THERE ARE MANY OTHER THINGS THAT NEED TO BE INCLUDED AS SOCIO-ECONOMIC MARKERS (PERSONALLY, I THINK THAT IS BEYOND THE SCOPE OF THIS DATASET)."
        - DOES THIS RELATE SPECIFICALLY TO WHERE THE PATIENT RESIDES, TO WHERE THE PATIENT IS EMPLOYED OR TO WHERE THE PATIENT WAS FOUND/TREATED AND TRANSPORTED FROM. EACH HAS ITS OWN CHARACTERISTICS THAT MAY RELATE TO FUTURE REQUIREMENTS
    - Race
        - BLACK -WHITE- COLOURED- INDIAN- ASIAN-CAUCASIAN-AFROAFRICAN-CAUCASIOAFRICAN-FOREIGN- WHERE DO WE START, WHAT DO WE USE SO AS NOT TO GO BACK TO A RACIAL MENTALITY
    - MARITAL STATUS - MARRIED 9SINGLE OR MULTIPLE WIVES)-DIVORCED-SINGLE-PARTNERSHIP-WIDOW-WIDOWER
    - Gender
2. Financial
    - Medical Aid
    - Employment level / sector details
        - EMPLOYED- UNEMPLOYED- SELF EMPLOYED
3. Administrative
    - Times of case: response, guide picked-up, on scene, departed, hospital informed, destination, refuelling; available,
        - "INSTEAD OF JUST A SPACE TO RECORD THE RESPONSE TIME AND ARRIVALS AND DEPARTURES, INCLUDE BOXES IN WHICH TO RECORD:
            - TOTAL SCENE TIME
            - TOTAL RESPONSE TIME TO SCENE
            - TOTAL TRANSPORT TIME"
        - THERE IS A STANDARD INTERNATIONALLY ACCEPTED LIST OF RESPONSE TIME CRITERIA THAT SHOULD BE CONSIDERED AND IS USED IN ALL FIRST WORLD SERVICES- TIME CALL RECEIVED, TIME VEHICLE MOBILE, TIME ON SCENE, TIME AT PATIENT'S SIDE, TIME LEAVE SCENE, TIME AT HOSPITAL, TIME LEAVE HOSPITAL, TIME BACK AT BASE ETC.
    - Mileage of case response, scene, destination, available
        - PERHAPS LIMIT THIS TO PATIENT CARRYING AND NON PATIENT CARRYING MILEAGE.
    - Response type: primary, assistance or transfer
        - PRIMARY EMERGENCY RESPONSE, PATIENT TRANSPORT, INTERHOSPITAL TRANSFER,
    - Incident location
        - "RECORD IN WHICH BUDGET MUNICIPALITY THE INCIDENT TOOK PLACE"
        - MORE DETAILS REQUIRED AS TO THE LOCATION IF WE ARE LOOKING AT FUTURE DEMOGRAPHICS AND INFORMATION
    - LOCATION TYPE
        - "THIS CAN INCLUDE SOME OR ALL OF THE FOLLOWING:
            - CLINIC
            - FARM
            - MINE / QUARRY

- INDUSTRIAL / FACTORY
- PUBLIC BUILDING
- RESIDENCE
- RESTAURANT
- HOSPITAL
- ROAD / HIGHWAY
- EDUCATIONAL INSTITUTE
- AIRPORT

AND MANY MORE …"

- Receiving hospital
- Assistance required from other EMS crew
  - SPECIFY IF ALS OR ILS ASSISTANCE.
- Incident type
  - "THERE CAN BE A SEPARATE CHECKBOX IF IT WAS AN INJURY WHILE ON DUTY"
- ICD-10 code for diagnosis
- MEDIC ALERT PRESENT OR NOT

4. Clinical
   - Patient priority – priority 1,2,3,4 / red, yellow, green, blue
     - … IS IN THE PROCESS OF MOVING TO THE TEWS (CAPE TRIAGE GROUP) SYSTEM UTILISING RED, ORANGE, YELLOW, GREEN & BLUE.
   - Procedures done / interventions performed
   - Interventions attempted
   - Equipment / stock used
   - Medical history
     - Medications
       - ADMINISTERED AND ROUTINE/PRESCRIBED
     - Events preceding illness
       - AMPLE HISTORY RELEVANT
       - PATIENT'S CURRENT SITUATION / ILLNESS
     - Recent travel history
       - SURELY THIS FALLS UNDER EVENTS PROCEEDING?
   - Vital signs: GCS; pupil size and reaction; respiration rate, rhythm and depth; SpO_2; air entry; $EtCO_2$; BP; pulse rate, rhythm and strength; ECG; HGT; capillary refill; APGAR; trauma score, TEMPERATURE
   - Loading factors
     - I'M NOT SURE WHAT "LOADING FACTORS" ARE, SO I CAN'T REALLY COMMENT ON HOW DIFFICULT OR EASY THEY WOULD BE TO RECORD.
     - THIS IS AN OLD AND REDUNDANT SYSTEM THAT NO ONE CAN ACTUALLY EXPLAIN. IT IS PRIMARILY FOR TRAUMA PATIENTS – ANY INFO LINKED TO LOADING FACTORS CAN BE GLEANED FROM INJURY DIAGRAMS, VITAL SIGN VALUES, SHOULD YOU BE SPECIFICALLY RESEARCHING PATIENT OUTCOMES.
   - Skin condition
   - Bleeding
   - Neurological defect
     - THE TERM "NEUROLOGICAL DEFECT" IS ALSO QUITE PUZZLING. IS IT A DESCRIPTIVE TERM? SOME KIND OF QUANTIFIABLE THING? AGAIN I CAN'T COMMENT BECAUSE IT IS UNCLEAR WHAT THIS IS.

    - BREAK THIS DOWN FURTHER TO UPPER & LOWER LIMBS.
- Defibrillation and other electrical therapy
- Intravenous infusions: fluid type, site; volume; time of set up
- Medications administered: type; route; dosage; time administered
- Present history
    - I'M NOT SURE IF IT BELONGS UNDER THIS HEADING, BUT THE TERM "PRESENT HISTORY" SOUNDS LIKE AN OXYMORON TO ME. IN VIEW OF THIS IT WOULD BE IMPOSSIBLE TO RECORD. PERHAPS THIS RELATES MORE TO THE CHIEF COMPLAINT AND IT'S HISTORY?
    - CHANGE TO CHIEF COMPLAINT &/OR FINDINGS ON ARRIVAL
- Detailed mechanism of injury
    - DETAILED MECHANISM OF INJURY MAY BE PROBLEMATIC. IN MY EXPERIENCE …, DETAILS ABOUT EXACT MOA ARE DIFFICULT TO OBTAIN OR ARE CONTRADICTORY. EXACT SPEEDS OF VEHICLES, EXACT NUMBER OF SHOTS FIRED, EXACT DISTANCES ETC. ARE APPARENTLY VERY SUBJECTIVE. AS A RESULT … [KEEP] THE MOA AS SIMPLE AS POSSIBLE AND [INCLUDE] BASIC FACTS IN THE DATASET.
- Primary and secondary survey findings
- Estimated fluid loss
- Burns estimation
- Provisional diagnosis – "EMS condition" versus ICD-10 coding
    - ICD-10 CODES ARE BASED ON THE EMS FINDING – IT IS TYPICALLY ASSIGNED AFTER DIAGNOSIS. GENERALLY AS RULE IT IS KEPT AS VAGUE AS POSSIBLE. E.G. ACUTE MYOCARDIAL INFARCTION IS CLASSIFIED AS I21.9 (AMI UNSPECIFIED – USUALLY BASED ON THE CLINICAL NOTES PROVIDED)
    - "THE ICD-10 CODES ARE, IN MY OPINION, COMPLETELY UNSUITABLE FOR THIS KIND OF DATASET. HOW OFTEN DO WE REALLY REACH A DEFINITIVE DIAGNOSIS? HOW OFTEN IS THAT DIAGNOSIS REALLY CORRECT? HOW WILL THE PERSON FILLING IN THE FORM EVER GET TO GRIPS WITH AND NAVIGATE THE HUGE NUMBER OF CODES? I THINK THE PLACE FOR A DIAGNOSIS TO BE RECORDED IS THE PLACE THAT IS BEST-SUITED TO MAKE A DEFINITIVE DIAGNOSIS – HOSPITAL."
    - THIS IS TYPICALLY ASSIGNED BY TEAM & NOT THE CREWS, CREATION OF A SPACE FOR IT YES, BUT NOT FOR THE CREWS TO FILL IN – ICD 10 CODES HAVE THE POTENTIAL TO BE VERY COMPLEX, AND THERE ARE ALL SORTS OF CODES THAT CANNOT GO TOGETHER, AND CAUSE CODES THAT NEED TO BE SPECIFICALLY DOCUMENTED.
    - Please see below for discussion on the "EMS condition"
- Mechanism of injury
    - THIS IS REPETITIVE OF DETAILED MECHANISM OF INJURY
- Findings on scene
    - THIS IS REPETITIVE – LINKS TO CHIEF COMPLAINT, PRESENT HISTORY SUGGESTION
- Settings of ventilators and infusions
- OXYGENATION, FIO2, TYPE OF MASK, FLOW RATE OF O2, SPO2
- Chief complaint
    - *LINKS TO PRESENT HISTORY*
- Level of care provided – based on procedures performed rather than staff present
    - THIS IS DUE TO CHANGE WITH THE INTRODUCTION OF NEW NRPL TARIFFS - THERE IS TO BE AN ASSESSMENT FEE (BASED ON

QUALIFICATION OF ASSESSOR & NOT NECESSARILY ON THE LEVEL OF CARE THE PATIENT REQUIRES) THERE AFTER, THERE WILL BE A MONITORING FEE BASED ON THE ACTUAL LEVEL OF CARE RECEIVED. E.G PT IS ASSESSED BY AN ILS FIRST, BUT ULTIMATELY THE IV ATTEMPT IS UNSUCCESSFUL, THEN THE PT IS MONITORED AT BLS LEVEL.

- Level of health care provider
    - THIS IS REDUNDANT, AS THE HPSCA NUMBERS AND CREW NAMES WOULD INDICATE LEVEL, PERHAPS SPECIFY QUALIFICATION INSTEAD.
- Request for higher level of care
    - INCLUDE SPACE FOR REASON WHY HIGHER LEVEL OF CARE NOT ARRIVE (E.G. CLOSER TO FACILITY VS ALS ARRIVAL ETC)
- FIO_2
- ALTITUDE AND CABIN PRESSURE
- EXTRICATION, IMMOBILISATION, KED, LONG/SPINAL BOARD, SCOOP, NECK COLLAR, TRACTION SPLINT, MAST, BOARD SPLINT, MILS,
- BREATHING - SPONTANEOUSLY, VENTILATED - MANUAL/MECHANICAL, TRACHEAL INTUBATION - OROTRACHEAL / NASOTRACHEAL / CRICOTHYROIDOTOMY / JET INSUFFLATION
- TUBES = NASOGASTRIC TUBE - OROGASTRIC TUBE - URINARY CATHETER - ENTEROSTOMY TUBES - FEEDING TUBES - ETC
- INFECTIOUS / NOTIFIABLE DISEASE BOX FOR PATIENTS WITH FEVER - MENINGITIS, MEASLES, CHICKENPOX ETC AND WHETHER CREW TOOK PROPHYLAXIS OR NOT

Any data that should not be collected (removed from the list)

- "WHILST A LOT OF THE DATA COLLECTION THAT HAS BEEN SUGGESTED IS RELEVANT I FEEL THAT IT MAY MAKE THE DATA COLLECTION PROCESS TEDIOUS AND TIME CONSUMING. YOU MAY FIND THAT THE DATA COLLECTED BY AMBULANCE PERSONNEL IS INACCURATE AS THEY MIGHT OMIT DATA, OR INACCURATELY FILL IT IN JUST TO GET THE FORM FILLED IN. THIS WILL INTERN LEAD TO FALSE DATA BEING PROJECTED"

Any data that should be collected but that is not on the list

- POTENTIALLY CRIMINAL INCIDENTS - IS LAW ENFORCEMENT ON SCENE, WHO, DETAILS OF OFFICER ETC
- SINGLE OR MULTIPLE PATIENT INCIDENTS
- NO MENTION MADE OF THE VEHICLES INVOLVED IN MOTOR VEHICLE COLLISIONS, MECHANISM, DAMAGE, ENTRAPMENT, ETC

EMS conditions

An EMS condition is defined as an illness, injury or combination of signs and symptoms that caused EMS activation.

Please comment on a proposed list of EMS conditions; suggest additions or deletions.

- Minor trauma
- Major trauma
- Respiratory distress
- Airway obstruction
- Respiratory arrest
- Cardiac arrest
- Seizure

- Shock
- Allergic reaction
- Environmental exposure
- Diabetes complication
- Cardiac problem
- Poisoning / OD
- Haemorrhage
- Chest pain
- Altered LOC
- Fever
- Pregnancy / labour / childbirth
- Stroke / CVA
- Abdominal pain
- Abdominal distress
- Hypertension
- Drug / alcohol problem
- Gynaecological problem
- Syncope / near syncope
- Dizziness
- Behavioural problem

Thank you for your assistance

Delphi Round Three

Dear participant

Thank you for those who gave comment on the second round of our study. Extremely valuable expert opinion was gained; opinion which is shaping the direction of this research. I ask that all those who have agreed to participate in this research please put forward your ideas as this the more experts who actively participate in this phase of the research, the stronger the findings become.

For this round of the email expert discussion group the list of data items to be collected has been rationalised based on the comments received. The most overwhelming and unanimous opinion is that too many data items are proposed for collection – see participants' comments below the tables at the end of this document.

Tables have made for included and excluded data items. In these tables will be my (the researcher's) comments (based on the comments from participants) on the data item. The included data table has a column for how the data will be collected on the patient report form. Below the tables will be all the participant comments linked to the appropriate data item.

Instructions for participants

1. Please study the tables of included and excluded data items, and the associated participant comments. Please note that the tables of included and excluded data items link to a table of participants' previous comments.
2. If you disagree with the placing of the data (i.e. excluded and you feel it should be included or vice versa) please add a comment.
3. Also please add a comment if you have something to add on how you think the data should be collected or classified.
4. Please remember the aim of this study: **to develop a data collection tool that can be used to determine the population of prehospital emergency medical care patients in South Africa**
5. As a guide to included and excluded data items please keep the following in mind: broad areas to be considered in defining the EMS patient population are:
   - Demographics;
   - Reason for calling;
   - On scene diagnosis; and
   - Severity of the clinical condition.
6. Please can you return comments to the researcher within 10 days of receipt of this document.

INCLUDED DATA ITEMS (Data to be collected)		
Data Item	**Researcher comment**	**Proposed data collection method**
1. Age group	The KZN DOH uses nine age bands: • < 5 years • 5 – 9 • 10 – 14 • 14 – 24 • 25 – 34 • 35 – 44 • 45 – 54 • 55 – 64 • 65+ Stats SA uses six age bands: • Infants 0 – 4 • Children 5 – 13 • Youth 14 – 24 • Young adults 25 – 34 • Mature adults 35 – 65 • The elderly >65 Health research tends to use 5 year bands for burden of disease. This type of band allows for easy research as it ties into international health research and the age groups are uniform in size for easy comparison.	Age group (tick box for each of the following) • 0 – 4 • 5 – 9 • 10 – 14 • 15 – 19 • 20 – 24 • 25 – 29 • 30 – 34 • 35 – 39 • 40 – 44 • 45 – 54 • 55 – 59 • 60 – 64 • 65 – 69 • 70 – 74 • 75 – 79 • 80 – 84 • 85+ It may be simply easier to have a 2 digit box for recording of exact age.
2. Race	Race is an important demographic detail as it provides information of illnesses / injuries that are more prevalent on persons of a particular race and information regarding equitable service delivery. International research continues to use race as a demographic identifier, therefore I believe that it should be included. A recent literature search of new research (published 2006) shows a number of differences in disease processes amongst different races that are pertinent to prehospital EMS. These include presentation of pre-eclampsia, and control of chronic hypertension and type II diabetes. Communication with academic units and the KZN DOH indicates that race is used as an indicator of how the health services are progressing in equitable service delivery. Stats SA uses five categories: • Black African • Coloured • Indian / Asian • White	Race group (tick box for each of the following) • Black African • Coloured • Indian / Asian • White • Other

	• Other	
3. Gender	While there has been a request for an "other" section in the gender category, this is not shown in research and may lead to facetiousness.	Gender (tick box for each of the following) • Male • Female
4. Times of case	Standard times should be used and all calculations will be done by the database / data analysis software. Call received and vehicle mobile are usually the same for the ambulance and therefore only vehicle mobile will be used (if there is a delay it is management info and can be obtained from the control room; additionally we only require the time it takes to get to a patient, not the delay an ambulance takes in starting response) This can provide us with the access to health care data (i.e. what is the minimum time delay a patient can expect in requesting medical assistance and actually receiving it) and what time of day particular incidents usually occur.	Times of case (Boxes for time in 24 hour format to be hand-written) • Time Mobile • Time On scene • Time Left scene • Time At hospital
5. Mileage of case	Calculations to be done later Again this provides access to health care data – how far is the patient from initial (EMS) and definitive (hospital) health care?	Mileage of case (Boxes for odometer reading to be hand-written) • Mobile / start of response • On scene • At hospital / drop of point
6. Response type		Tick-boxes for: • Primary response • Request for assistance (Ambulance crew requesting for ALS) • Inter-facility transfer
7. Incident location (broad area)	The district health system in place in KZN uses sub-districts in the reporting of health care statistics in district municipalities / health districts. For metropolitan municipalities suburb groupings may be more appropriate; however it is appropriate to use whatever system is in place for reporting other health statistics.	Boxes for alpha-numerical codes (hand-written) for either sub-districts (for district municipalities) or suburbs (metropolitan municipalities) Codes would be district specific and code sheets would have to be individualised for each district.
8. Incident location (specific)	A rationalised list of specific incident locations can assist in identifying where our patients are coming from, why they called and who they are. **Please assist in rationalising this list:** • Clinic • Farm • Mine / quarry • Industrial / factory • Public building • Residence • Restaurant • Hospital • Road / highway • Educational Institute • Airport	Boxes for alpha-numerical code.

	• Doctors' rooms • Shops • Other	
9. Receiving hospital or clinic	Indicates which patient type goes to a specific institution	Boxes for alpha-numerical codes (hand-written).
10. Assistance required to manage the patient	Can include other medical (e.g. specialised medical services required such as helicopter services or medical doctor – both on scene or telephonically for advice) or rescue expertise that is required to manage the patient. This can supply data on the severity of the patient's clinical condition.	Tick boxes for assistance required: • Aeromedical services • Medical practitioner (doctor) • Technical rescue • Telephonic advice • Other
11. Incident type / Mechanism of injury	For trauma where the mechanism of injury is different to the EMS condition / chief complaint; e.g. MVA is the incident type but the patient is hypoxic with chest trauma. The incident type should perhaps be divided into medical and trauma, with trauma having a number of subsections. **Please assist with a list of trauma mechanism of injuries.**	Boxes for alpha-numerical code for incident type / trauma mechanism of injury – according to list generated
12. Medical History	An entire medical history is not needed for patient population data; however a list of major comorbidities may be useful in determining severity and demographics. **Please assist with this list:** • Ischaemic heart disease • COPD • Asthma • Diabetes • TB • HIV • Hypertension • Current pregnancy	Tick-boxes for major comorbidities – according to list generated
13. Vital signs	The TEWS specific vital signs are important for severity determination: • Respiratory rate • Heart rate • Systolic blood pressure • Temperature • AVPU • Haemoglucose test By including these elements of the TEWS system and the rest of the system elsewhere the patient's severity can be calculated by the database software. It seems reasonable to include the TEWS system of triage in this study as it appears very likely to become widely implemented in South Africa. For those who are unsure of this triage system you can consult www.triagesa.co.za	Boxes for recording: • RR – numerical 2 digit • HR – numerical 3 digit • SBP – numerical 3 digit • Temperature – tick boxes for tactile estimation: Normal Hot Cold • Temperature – numerical 3 digit (2 + decimal) for recorded temperature • AVPU – tick boxes • HGT - numerical 3 digit (2 + decimal)
14. Burns estimation	TEWS requires it - Will assist with determining the severity of the patient Assessed using either: • Rule-of-nines: Not as accurate but possibly easier to learner and remember • Lund and Browder chart: more accurate but must be available as a guide. A chart could be on the PRF or clipboard.	2 digit boxes for numerical recording

	Your opinions please	
15. Provisional diagnosis – EMS condition vs ICD-10	An EMS condition list needs to be sourced and evaluated, or developed The development or evaluation of an EMS condition list is not part of this specific discussion group but does need to be considered later in this research project. This will give an indication of the patient's reason for calling and severity of the case. ICD-10 coding will not be used	Alpha-numerical coding and boxes for the codes. This list is for further study.
16. Chief complaint	A chief complaint list needs to be sourced and evaluated, or developed The development or evaluation of this list is not part of this specific discussion group but does need to be considered later in this research project	Alpha-numerical coding and boxes for the codes. This list is for further study.
17. Level of care provided	Level of care on scene Data analysis can hopefully determine of a higher / lower level of care was required	Tick-boxes for: • BLS • ILS • ALS – CCA / NDip • ALS – BTech The differentiation between ALS CCA / NDip and ALS BTech is in the higher scope of practice: RSI and Thrombolysis

EXCLUDED DATA ITEMS	
DATA ITEM	**RESEARCHERS COMMENTS**
18. Detailed mechanism of injury	Fits in with incident type for trauma: burns, etc Does not need to be detailed at all
19. Residential area	Will be hard to capture accurately and will require extra-ordinary questioning (i.e. unrelated to clinical management of patient) from EMS personnel.
20. Type of housing	Will be hard to capture accurately and will require extra-ordinary questioning (i.e. unrelated to clinical management of patient) from EMS personnel.
21. Marital status	I cannot see the relevance to this question and it will require extraordinary questioning of the patient
22. Medical Aid	This can reasonably be extrapolated from point of delivery – public or private hospital
23. Employment level / sector	Useful for equitable service delivery but is extraordinary questioning
24. ICD-10 code	Overwhelming negative response – this will be replaced by the EMS condition – a list that must still be explored.
25. Medic Alert	Clinical data only – not patient population
26. Patient priority	This can be worked out using the TEWS system from data collected – thus being more accurate and eliminating the need for a calculation by EMS crews
27. Procedures / interventions performed	Could speak to severity of the case, however I do not believe that we are ready for this as very little selective spinal clearance takes place and many patients seem to inappropriately get IV lines
28. Interventions attempted	Clinical data only – not patient population
29. Equipment / stock used	Clinical data only – not patient population
30. Events preceding	Clinical data only – not patient population
31. Recent travel history	Clinical data only – not patient population
32. Medications	Clinical data only – not patient population
33. Loading factors	Overwhelming negative response
34. Skin condition	Clinical data

35. Bleeding	Severity from vital signs Difficult to grade Clinical data
36. Neurological defect	Clinical data
37. Defibrillation / other electrical therapy	Clinical data
38. IV infusions	Clinical data
39. Medications administered	Clinical data
40. Primary and secondary survey findings	Clinical data
41. Estimated fluid loss	Clinical data Often inaccurate
42. Settings of ventilators and infusions	Clinical data
43. Request for higher level of care	Management info – not required for patient population data
44. FiO_2	Clinical data
45. Altitude / cabin pressure	Clinical data
46. Infectious / notifiable diseases	Clinical data
47. Extrication, immobilisation, splint, MAST	Clinical data
48. Tubes	Clinical data
49. Present history	This section is covered adequately by chief complaint.
50. Mechanism of injury	This section is covered adequately by Incident type
51. Findings on scene	This section is covered adequately by Chief complaint
52. Level of health care provider	Duplicated above
53. Breathing	Clinical data

Participants' previous comments on data items	
Data Item	**Participants' previous comment**
1. Age group	agreed
2. Race	black -white- coloured- Indian- asian-caucasian-afroafrican- caucasioafrican-foreign- where do we start, what do we use so as not to go back to a racial mentality – I think we should drop RACE as it has no bearing on anything anymore. Socioeconomic criteria are based on income, education, address, qualification, not race. Only relevant demographic information is resident vs foreign which is not critical. So let's drop it. I feel that marital status and race should be excluded, although it could be a useful tool for statistical purposes. This must stay if only to be able to assess the quality of the services being accessed/delivered. I suggest that you approach the census office for the accepted categorisations. Also

	consider how best to make the categorisations for an individual patient. We have found unwillingness by our staff to categorise patients due to the blurring of boundaries in modern multi-cultural society, and as such request the patient to categorise themselves, if willing. What do you do in the case that a patient is unable to read? I have to agree on this comment – in a country as diverse as our own, perhaps the socio economic data subset is more appropriate I think race is important for research/resource allocations etc – I would contact the appropriate government department for the appropriate terms? Only place this would be of value would be to assess epidemiology of different disease processes and how these differ between the race groups. Is this pertinent to the EMS system?
3. Gender	Agreed, but must include unknown
4. Times of case	"Instead of just a space to record the response time and arrivals and departures, include boxes in which to record: Total scene time Total response time to scene Total transport time" There is a standard internationally accepted list of response time criteria that should be considered and is used in all first world services- time call received, time vehicle mobile, time on scene, time at patient's side, time leave scene, time at hospital, time leave hospital, time back at base etc. Leave in Most services currently use some form of communication centre to perform call taking and dispatching functions. In many cases the call taking and dispatching functions are NOT done by the same person or even the same centre and as such the time to process the incident from call answer to crew notification / dispatch becomes relevant. Another important factor that must be considered is that sometimes these centres are not under the management hierarchy of the EMS service. As a result situations may arise where it is difficult to pinpoint where delays are experienced in the process from call answer to arrival on scene. This makes the recording of call process time on the patient report a vital information piece. I disagree with this. One of the main factors reducing the validity of data extracted from patient records is administrative burden. The figures suggested are readily available from the raw data as supplied by the clinician – there is no reason to ask them to undertake calculations in addition to all else that is required of them. Total transport time" this information can be gleaned from the original data set proposed of times. Too often crews make errors due to tiredness; rather keep this type of time keeping to a control / dispatch centre data collection. The international standard is all fine and well, but – it is based on an economical situation very different to SA. Currently in the rural sectors of SA, it is sometimes in excess of 2 hours before any ambulance (pvt or government) can get to the scene of an incident, which obviously has massive implications for patient outcome. Even in an urban setting this challenge – at this stage predominantly the government sector is so overloaded that under 20 min is considered a fantastic turn out. times I agree you should use the internationally used terms e.g. time mobile, on scene etc
5. Mileage of case	Perhaps limit this to patient carrying and non patient carrying mileage. – agree, its individual times, total distance I feel strongly that the capturing of Mileage at the response, scene, and destination, available should be maintained as the information is vital in researching the fleet characteristics and dynamics of patient transport in a specific geographical area. The same applies. These can be calculated at a later stage Perhaps limit this to patient carrying and non patient carrying mileage.

	While this will make jobs easier, once again, the risk of miscalculation is a problem. Easier to write down the odometer reading as you see it and allow someone who is paid to calculate to do the maths. Keep your data as is
6. Response type	primary emergency response, patient transport, interhospital transfer, agreed Maybe also add Rescue (Technical Rescue) as a category
7. Incident location (broad area)	"Record in which budget municipality the incident took place" more details required as to the location if we are looking at future demographics and information Ideally, it would be good to have a GPS coordinate, but this is unlikely to be practical. An alternative is a map grid-reference providing the same map is used throughout! I believe expecting the crews to identify the 'budget' municipality will lead to poor data quality – again this can be extracted from accurate incident location data afterwards.
8. Incident location (specific)	"This can include some or all of the following: Clinic Farm Mine / quarry Industrial / factory Public building Residence Restaurant Hospital Road / highway Educational Institute Airport And many more …" doctors rooms Its useful but not essential at the end of the day. Nice for a few publications but not for national statistics. Might be worth while to save space to put on block on the front of the PRF and all the options in a box at the back with a numbering code. Not sure any other country has it. One can question firstly the relevance of this type of Information. Also in your rural areas there are no restaurants etc. the list of location type should be rationalized. I disagree. Can't see the relevance of this. If one uses the ICD 10 codes as a guideline, then you may perhaps limit it to 9 general areas – remind me to send you the cause code area break down
9. Receiving hospital or clinic	and clinic etc Agreed, but should be expanded to include alternatives to hospitals such as clinics etc
10. Assistance required to manage the patient	Specify if ALS or ILS assistance

	Could the Medical Dr. Also not be included as a form of assistance to an ESV crew This must be coded. There are potentially other options too – doctor being one I suppose
11. Incident type / Mechanism of injury	"There can be a separate checkbox if it was an injury while on duty" I don't know what is meant by this. Some potential categories would be useful to aid understanding
12. Medical History	I believe that the detailed description of medical history is important as part of clinical record, but would be happy with a simple series of checkboxes that identify major comorbidities e.g. IHD, COPD, Asthma, Diabetes etc
13. Vital signs	GCS; pupil size and reaction; respiration rate, rhythm and depth; SpO_2; air entry; $EtCO_2$; BP; pulse rate, rhythm and strength; ECG; HGT; capillary refill; APGAR; trauma score, temperature AVPU score These are all important components of the clinical record, but will add little to our understanding of patient population. We have been running the CIS in … for over a year, and have yet to even delve into this area. It has research potential, but in terms of the scope of your project, I'm unsure of value. Vital signs?? need for APGAR it's up to you but I don't bother with it
14. Burns estimation	Using which measure? These are all important components of the clinical record, but will add little to our understanding of patient population
15. Provisional diagnosis – EMS condition vs ICD-10	ICD-10 codes are based on the EMS finding – it is typically assigned after diagnosis. Generally as rule it is kept as vague as possible. E.g. Acute Myocardial Infarction is classified as I21.9 (AMI unspecified – usually based on the clinical notes provided) "The ICD-10 codes are, in my opinion, completely unsuitable for this kind of dataset. How often do we really reach a definitive diagnosis? How often is that diagnosis really correct? How will the person filling in the form ever get to grips with and navigate the huge number of codes? I think the place for a diagnosis to be recorded is the place that is best-suited to make a definitive diagnosis – hospital." This is typically assigned by team & not the crews, creation of a space for it yes, but not for the crews to fill in – ICD 10 codes have the potential to be very complex, and there are all sorts of codes that cannot go together, and cause codes that need to be specifically documented. Leave it out in my humble opinion ICD needs to be rejected outright - far too complex and as such will yield questionable data. The EMS condition is the way to go, but categorising it is where the challenge is. My experience showed that there was a natural tendency not to commit to a diagnosis, regardless of whether it was labelled provisional or not. As such we had a significant number of patients where no diagnosis was offered or where they were categorised as other. This is difficult to explain, because we offered two levels of diagnostic accuracy: common complaints: AMI, asthma etc, and a range of system-based diagnoses such as gastrointestinal complaint etc that I believe covered all eventualities - we still got loads of other though.
16. Chief complaint	links to present history agreed Not clear what the panellist means here?
17. Level of care provided	This is due to change with the introduction of new NRPL tariffs - there is to be an assessment fee (based on qualification of assessor & not necessarily on the level of care the patient requires) There after, there will be a monitoring fee based on the actual level of care received. E.g. Pt is assessed by an ILS first, but ultimately the IV attempt is unsuccessful, then the pt

	is monitored at BLS level. The level of qualification in terms of the crew is catered for and if further assistance is required that is also catered for. What I feel should be included is the level of care that was actually required. Then we can say things like" of all calls responded to by ILS, 70% required only BLS intervention" this type of information is useful. This is important - it will enable us, in combination with the 'triage' and in some cases the trauma 'score' to triangulate patient severity. This is a key component of understanding the severity of patients and therefore the resources required. I believe it should be a scope of practice thing, but this is also problematic because I believe that a proportion of patients require higher levels of care, but don't receive it. For example, if a patient has fractured long-bones, they would be managed by convention by an intermediate life support practitioner in most cases (splinting, Entonox, IV fluid), however, they should have received an ALS response for IV pain relief. This categorisation therefore needs to be interpreted as the level of care provided (de facto) and not the level of care that should have been provided (optimum).
18. Detailed mechanism of injury	Detailed mechanism of injury may be problematic. In my experience …, details about exact MOA are difficult to obtain or are contradictory. Exact speeds of vehicles, exact number of shots fired, exact distances etc. are apparently very subjective. As a result … [keep] the MOA as simple as possible and [include] basic facts in the dataset. Agreed – rather take a photo with a cell phone and then delete if unnecessary, otherwise can turn PRF in a thesis Agree will probably only be able to get proper details retrospectively Keep it simple, although we did try to differentiate between slow and fast motor-vehicle accidents (although I do appreciate the comments made by another panellist over the reliability of the data). I would however say that in reality, a large proportion of what is provided is subjective in some form. See the … PCR for the categories we used. I think they work. You may need to expand some of the penetrating trauma stuff given your epidemiology
19. Residential area	Don't know what this means. Do you mean suburb? What happens if the incident is not in a residential area
20. Type of housing	"Type of housing. I haven't seen the motivation for having this in the dataset (I've probably missed something), but I can't think of any really good reason to have it there. I know you're trying to describe a population, but if you include this then there are many other things that need to be included as socio-economic markers (personally, I think that is beyond the scope of this dataset)." This set of information gives a good indication operationally of probable response times to the patient's side, type of road surface, possible hazards/hurdles, and probable population demographics which in the long run will make a difference to planning, budgets, vehicles etc. I think it should stay. Does this relate specifically to where the patient resides, to where the patient is employed or to where the patient was found/treated and transported from. Each has its own characteristics that may relate to future requirements home / work – extra block I agree with the comments below. This is too difficult to define adequately. There are too many permutations of residing, working, visiting etc. What if they are in a public place and not a house? I think that it would be more appropriate to capture setting of evacuation, e.g. rural, urban, sea, mountain etc
21. Marital status	Married (single or multiple wives)-divorced-single-partnership-widow-widower Has important future demographic information as to who is using /abusing /misusing the EMS service. I feel that marital status and race should be excluded, although it could be a useful tool for statistical purposes.

	I don't see how marital status is relevant, unless it impacts on minor status in terms of the law. As it is, a child of 14 can make decisions relating to their health.
22. Medical Aid	I don't see the relevance in terms of describing patient population, except perhaps to understand the proportion of patients with and without medical aid – I am sure that this can be obtained through other sources however.
23. Employment level / sector	employed- unemployed- self employed registered indigent See above. I also feel there are ethical issues here. If this information is not required in order to treat the patient, is it acceptable to potentially embarrass someone by asking them?
24. ICD-10 code	Are the guys going to carry around a ICD – 10 decoding manual? Probably not. Are all PRFs going to be computerised, probably not. Too much to ask for on this one me thinks!! Disagree. This is unworkable in the context it is being proposed I think that this should be taken out – it is redundant – now looking over the other section which allows for ICD 10 codes
25. Medic Alert	If YES, what's on it.!! This is an important part of the clinical record, but unlikely to add to our understanding of the patient population
26. Patient priority	… is in the process of moving to the TEWS (Cape Triage Group) system utilising red, orange, yellow, green & blue. TEWS requires everybody to have the coded card as index which means it is going to have to be on the PRF just like the GCS cause no one will remember it by heart. Going to need lots of space or very small writing. I'm unaware of the CTG stuff, but I would argue that consistency is useful, and if that is not possible explicit identification of the system in use. Interestingly, it is not common in the UK to use any triage system outside of major incidents – this is hugely problematic in terms of any description of patient population as you are unable to stratify according to severity. This needs special attention for that reason – very important that this is properly defined.
27. Procedures / interventions performed	Part of clinical record clearly, but does it add to our understanding of patient population
28. Interventions attempted	Part of clinical record clearly, but does it add to our understanding of patient population
29. Equipment / stock used	Part of clinical record clearly, but does it add to our understanding of patient population
30. Events preceding	AMPLE history relevant patient's current situation / illness I don't really have an opinion on this, but note that when I introduced the AMPLE approach in …, it was largely rejected (quite adamantly) in favour of a medical approach that uses the on arrival, on examination etc approach
31. Recent travel history	Surely this falls under events proceeding agree disagree - largely irrelevant
32. Medications	administered and routine/prescribed
33. Loading factors	I'm not sure what "loading factors" are, so I can't really comment on how difficult or easy they would be to record. This is an old and redundant system that no one can actually explain. It is primarily for trauma patients – any info linked to loading factors can be gleaned from injury diagrams, vital sign

	values, should you be specifically researching patient outcomes Excise Agree very vague The loading factor should be removed and a trauma score should be included This originates from the SA Trauma Score. I don't think it is in use any longer (but don't quote me on that!). This is an important variable to have, namely an objective assessment of the trauma severity. See my earlier comments about being able to stratify patients based on severity. There are alternatives out there such as the RTS etc. Perhaps it would be worth consulting a trauma expert to provide input on the most appropriate scoring system. A quick literature search might provide the answer also.
34. Skin condition	signs/symptoms What is meant…cool and clammy, open wounds? These are all important components of the clinical record, but will add little to our understanding of patient population
35. Bleeding	how will you grade or measure this These are all important components of the clinical record, but will add little to our understanding of patient population
36. Neurological defect	The term "neurological defect" is also quite puzzling. Is it a descriptive term? Some kind of quantifiable thing? Again I can't comment because it is unclear what this is. Break this down further to upper & lower limbs. agree These are all important components of the clinical record, but will add little to our understanding of patient population
37. Defibrillation / other electrical therapy	What details regarding this? Just whether it was used or not? These are all important components of the clinical record, but will add little to our understanding of patient population
38. IV infusions	These are all important components of the clinical record, but will add little to our understanding of patient population
39. Medications administered	Please include a section on drug infusions place and in place at the time of treatment / transfer These are all important components of the clinical record, but will add little to our understanding of patient population
40. Primary and secondary survey findings	These are all important components of the clinical record, but will add little to our understanding of patient population
41. Estimated fluid loss	is this bleeding again included in here with others These are all important components of the clinical record, but will add little to our understanding of patient population
42. Settings of ventilators and infusions	oxygenation, FiO2, type of mask, flow rate of O2, SpO2 purely clinical, nothing to do with demographics, but needed all the same on PRF These are all important components of the clinical record, but will add little to our understanding of patient population Mode of Ventilation : IPPV, SIMV, Spont
43. Request for higher level of care	include space for reason why higher level of care not arrive (e.g. closer to facility vs ALS arrival etc)

	Agreed, but the reason for a request not being met is available elsewhere - control records for example. Do not unnecessarily add to administrative burden
44. FiO_2	These are all important components of the clinical record, but will add little to our understanding of patient population
45. Altitude / cabin pressure	
46. Infectious / notifiable diseases	
47. Extrication, immobilisation, splint, MAST	
48. Tubes	
49. Present history	I'm not sure if it belongs under this heading, but the term "present history" sounds like an oxymoron to me. In view of this it would be impossible to record. Perhaps this relates more to the chief complaint and it's history? Chief complaint + AMPLE is ample enough (sorry) change to chief complaint &/or findings on arrival, perhaps recent history, but isn't this covered under the AMPLE approach
50. Mechanism of injury	This is repetitive of detailed mechanism of injury excise! Agree I think this has been dealt with
51. Findings on scene	this is repetitive – links to chief complaint, present history suggestion excise agree agreed
52. Level of health care provider	This is redundant, as the HPCSA numbers and crew names would indicate level, perhaps specify Qualification instead Be careful not to exclude other practitioners - doctors are an example
53. Breathing	

Participants' comments on the volume of data

"With regards to the process. We must be careful not to overload the practitioners with irrelevant data.
The data currently collected are defined by National Health District Information Systems. See Attachment.
See also the approved patient report which is currently in use for data collection. Currently there is a big drive to train practitioners to complete the current format in full to prevent legal cases."

"This is turning into an exercise of *everything that we want to know* if we have enough space and motivation to one required for demographic purposes but which then is not sufficient operationally, administratively, financially or statistically."

“I would however like to make one comment outside of the document. On average 18 ambulances serve about 8000 calls a month in the region I manage. That equates to about 7 calls per 12 hour shift per vehicle, not taking into account that on some days a vehicle can see 25 patients per shift. This leads to a situation where lengthy patient report forms may not be feasible both operationally and financially. When one factors in the other functions of an ECP ie wash and clean vehicle, perform equipment checks, restock of consumables, completion of other administrative work, tea and lunch breaks etc. one can clearly see that a 12 hour shift should in fact be 14 hours long.

While we all understand and appreciate the importance of complete patient report forms I must state that the amount of detail that is suggested for inclusion in your study may NOT be feasible in the practical environment due to the overwhelming of the staff during peak periods.

I would however like to make a suggestion. What about dividing the report into sections containing key pieces of information based on the prioritisation of the patient? Ie for a P3 you only complete section one, for a P2 section one becomes compulsory and for P1 section 3 becomes compulsory while section 4 can be used for certification of death where applicable.

My thought process being that during peak periods staff finds it difficult or close to impossible to physically perform treatment, perform observations every 10 minutes and record the information correctly if six patients are in the vehicle at the same time and a lengthy form is used . Surely we require all important information on seriously injured patients and less on minor cases.”

“I think you should better demarcate the boundaries of the project now that it has been modified. You have asked for stuff enabling us to describe our patient population. Everything that is in here does that, but it would be worthwhile to further refine the parameters. I guess you are interested in the macro level – chief complaint, provisional diagnosis, response data, locations of incidents, triage, level of care provided, etc. I think it would be difficult to explore patient based on vital sign parameters, interventions, drugs etc.”

“I believe the next step should be to select the variable headings you are focusing on, and start to describe the categories that compose them.”

“Whilst a lot of the data collection that has been suggested is relevant I feel that it may make the data collection process tedious and time consuming. You may find that the data collected by ambulance personnel is inaccurate as they might omit data, or inaccurately fill it in just to get the form filled in. This will intern lead to false data being projected”

Delphi Round Four

Dear participant

We have come to the final round of our expert email discussion group. Thank you for your valuable comments and input into this phase of the study. The opinions and insight given during the first three rounds of this exercise have been extremely valuable in shaping the proposed minimum dataset (MDS). The previous three rounds have been analysed and a final MDS for defining the patient population has been developed. The testing phases will now begin; many of the inputs received will be considered during this stage.

The aim of this research project is to develop a tool to assist in defining the patient population using the prehospital emergency medical services (EMS). This requires that a MDS be developed. This MDS is the minimum data that will allow us to determine our patient in terms of:

- Demographics;
- Reason for calling (chief complaint(s) of the patient);
- Clinical condition / provisional diagnosis; and
- Severity of the clinical condition.

In the initial writing up of this research proposal the aim was always to define this population. The project, however, got side tracked when I was attempting to develop both the required MDS and get all the other data elements required on a patient report form (PRF) to meet the other needs of the industry. Based on comments from participants in the first round of this discussion group, the scope of the discussion group (and the research project) was scaled down to only develop the MDS for patient population determination and leave the other elements of the PRF alone. The end result is a MDS that (once tested and verified) can be included in a PRF.

Each particular EMS organisation has its own data needs and it would probably be impossible to create a user friendly PRF that could meet all the needs of all services. Therefore it is envisaged that this MDS could be included in a variety of PRFs across the industry; each PRF meeting the needs of a particular EMS organisation. There is scope for further development of other datasets for additional information groupings; e.g. resource utilisation data, clinical management data, billing data. These datasets could then be integrated (there would be some overlap between datasets) on to a PRF designed to meet the needs of a particular organisation. Analysis could then take place of each MDS via the electronic database. Please see the attached PDF document for a diagrammatic illustration of this.

Instructions for participants

1. Please study the table of data elements to be collected, the collection method and any explanation.
2. If you have any opinion or insight regarding this dataset, please submit your comment. All input will be of value for the test phase.
3. Please remember the aim of this study: **to develop a data collection tool that can be used to determine the population of prehospital emergency medical care patients in South Africa**

4. As a guide to included and excluded data elements please keep the following in mind: broad areas to be considered in defining the EMS patient population are:
   - Demographics;
   - Reason for calling / chief complaint;
   - Clinical condition / provisional diagnosis; and
   - Severity of the clinical condition.
5. Please can you return comments to the researcher within 10 days of receipt of this document.

DATA SET		
Data Element	**Data collection method**	**Explanation**
1. Age group	3-digit box for actual age Tick boxes for categories: • Neonate • Infant • Child • Youth • Adult • Elderly	The ideal is to have the exact age but this may not be possible (e.g. unconscious patients); in this case a broad category will be the best obtainable.
2. Race	Tick boxes for categories: • Black African • Coloured • Indian / Asian • White • Other	
3. Gender	Tick boxes: • Male • Female	
4. Times of case	4-digit boxes for each of the following: • Time mobile • Time on scene • Time at patient's side • Time left scene • Time at hospital	
5. Mileage of case	6-digit boxes for odometer reading: • Start of response • On scene • At hospital / drop of point	

6. Response type	Tick boxes for: • Primary response • Request for higher level of assistance • Inter-facility transfer • Additional transport / manpower	Primary response – initial vehicle(s) dispatched Higher level of assistance – either medical (i.e. ALS or rescue) Additional transport / manpower – multi-patient incidents where initial vehicle(s) require more staff or transport, but the staff is not of a higher level.
7. Incident location (broad area)	Boxes for alpha-numerical codes (hand-written) for either sub-districts (for district municipalities) or suburb groupings (metropolitan municipalities)	Codes would be district specific and code sheets be individualised for each district. Codes will be developed in conjunction with the EMS provider and the municipality.
8. Incident location (specific)	Tick-boxes for: • Public roads • Industrial facilities • Health facilities • Commercial facilities • Residence • Agricultural	Industrial facilities – Manufacturing, mining, etc Health facilities – hospitals, clinics, doctors rooms, etc Commercial facilities – offices, shops, schools, restaurants, etc
9. Receiving hospital or clinic	Boxes for alpha-numerical codes (hand-written).	Codes would be district specific and code sheets be individualised for each district. Codes could include all the hospitals and have a generic code for clinics or other drop off points (this can be refined during the testing phase)
10. Assistance required to manage the patient	Tick boxes for assistance required: • Aeromedical services • Medical practitioner (doctor) • Rescue • Telephonic advice • Other	
11. Incident type / Mechanism of injury	Boxes for alpha-numerical code – according to a list to be generated	
12. Major Comorbidities	Tick-boxes for: • Cardiac disease • Chronic lung disease • Asthma • Diabetes • TB • HIV • Hypertension • Current pregnancy • Cancer • Paralysis	Cardiac disease – IHD, CCF, previous MI, angina Paralysis – quad-/ hemi-/ para-plegia
13. Vital signs	Boxes for recording: • RR – numerical 3 digit • HR – numerical 3 digit • SBP – numerical 3 digit	Ideally a temperature would be recorded but a tactile estimation may have to be accepted until thermometers become standard prehospital equipment.

	• Temperature – numerical 3 digit (2 + decimal) for recorded temperature
	• HGT - numerical 3 digit (2 + decimal)
	
	Tick boxes for:
	• Temperature –tactile estimation:
	  ○ Normal
	  ○ Hot
	  ○ Cold
	• AVPU
	  ○ Alert
	  ○ Responding to voice
	  ○ Responding to pain
	  ○ Unresponsive	

14. Burns % estimation	2 digit boxes for numerical recording	The rule-of-nines will be used.
15. Provisional diagnosis / EMS condition	Alpha-numerical coding and boxes for the codes. This list is for further study.	
16. Chief complaint	Alpha-numerical coding and boxes for the codes. This list is for further study.	

Appendix F: Researcher Profile

The researcher has being involved in the EMS in South Africa for the past 13 years. He had the following roles and performed the following functions, thus gaining a well-rounded understanding of the EMS.

i. Practicing clinician for private and public EMS.
ii. Communications centre operation for private EMS.
iii. Participation in research and performance management; including data collection, capture and analysis.
iv. Management of a state ambulance service.
v. Lecturing at two universities offering paramedic education.
vi. Professional board inspections on quality in EMS education and training.

Appendix G

Information letter: Expert group: Delphi study

A project entitled: *Development of a tool to define the population of emergency medical care users,* is being undertaken by myself in order to complete a Master's Degree in Technology in the Department of Emergency Medical Care and Rescue at the Durban Institute of Technology. This will involve the development and testing of a patient report form to collect data to define the patient population using the prehospital emergency medical services (EMS).

Experts will be requested to assist:

1. Determining what we need to know about our patients in order to describe them (this may include demographics, diagnosis, severity, etc);
2. What the minimum data is that we need to collect to answer the questions and describe the patients; and
3. Deciding what other data must be collected by a EMS patient report form to meet the audit, clinical, legal, management and billing requirements of an EMS.

Objectives 1 and 2 will be met by participation in a focus group followed by email discussion. Objective 3 will be met by email discussion only.

The focus group will be held at the Durban Institute of Technology on a date mutually acceptable to the participants. The group will consist of no more than 8 – 12 participants and will run for approximately two hours. Following the focus group the ideas developed will be disseminated via the email for further discussion and development of ideas. The email group will consist of the focus group and an

additional 15 – 30 participants. Four rounds of email discussion will take place over an eight-week period.

The focus group will be recorded, both voice recording and by means of a scribe, for later analysis. The recording will not be made available as part of the study, only the ideas developed. All participants will be required to sign a confidentiality agreement with specific emphasis on protecting the privacy of the individuals participating in the focus group. No comments will be attributable to any one particular participant.

All emails in the discussion group will be between participant and researcher, no group emails. Discussion will be collated from each round and sent to the participants in the following round. Again no comments will be attributable to any one particular participant.

As an expert I am asking you to participate in an email-based Delphi study (discussion). By participating in this research you, as an expert in the South African EMS, are assisting in determining accurately who the users of the EMS are. This will allow for, amongst others, better resource allocation, determination of appropriate resource utilisation, and appropriate education and research. You are requested to participate of your own free will and are free to withdraw at any time, without reason, from the project. Following the study you are entitled to a report. By replying to the email sent you are confirming your informed consent.

Please confirm via email to jamesb@dit.ac.za, by [date] if you are able to be part of the focus group and / or the email discussion group. If you have any questions please do not hesitate to ask, either the researcher at the above email address or on 072 1145 129 or 031 308 5203, or the research supervisor, Professor L Grainger, at lindag@dit.ac.za or 031 308 5203.

Thank you

_____
James Bowen
Researcher

Appendix H: User Instructions to Patient Report Form

Enquiries: James Bowen 072 114 5129 jamesb@dut.ac.za

INSTRUCTIONS TO USERS

- This form is to be scanned and electronically analysed. Please therefore try to keep marks inside boxes and write codes or actual figures in as clear a script as possible.

- Whenever "other" is selected, please use the free space area to make notes.

- Please note that this is not a clinical patient record or an administration information form, but a record used to determine patient population. The patient population is defined by (i) who the patient is (demographics), (ii) why the patient is using the EMS (clinical condition) and (iii) what is the patient's access to health care (times, distances, locations, destination).

1. Date / District / Case number

- This section is the unique case identification number
- Date: year, month, day (yyyy, mm, dd)
- District number
  - Ugu: 21
  - Ethekwini: 43
- Case number: EMRS case number

2. Date of Birth

- Year, month, day (yyyy, mm, dd)
- Complete what you information you obtain from the patient, family member or documentation. If you do not obtain any information, leave blank

3. Patient Demographics

3.1. Race

- Select the appropriate box; only one selection should be made
- If other race, please select other and specify

3.2. Age (exact)

- If you have the patient's exact age, then fill in the blocks
- This is gained from questioning the patient or family member, or from the date of birth; please do not guess an exact age.

3.3. Age (estimated)

- Select the appropriate box; only one selection should be made.
- Not necessary if exact age is supplied

3.4. Gender

- Select the appropriate box; only one selection should be made

4. Time and Distance

	Time	**Distance**
Mobile	The time that the **emergency vehicle is dispatched** by the control centre	Odometer reading when **response is started**
On scene	The time that the **emergency vehicle arrives on scene**	Odometer reading **at the scene**
At patient's side	The time that the **first emergency care practitioner from that vehicle arrives at the patient's side**. This may be the same time as on scene or it may be later depending on distance from vehicle to patient, access to patient, crowd control, hazards, etc	
Left scene	The time that **emergency vehicle leaves the scene**, with or without the patient	
At destination	The time that the **emergency vehicle arrives at the drop-off point with the patient**. This is left blank if no patient transport occurs	Odometer reading **at drop-off point**. This is left blank if no transport occurs

5. Trauma

This section is only completed if it is a trauma patient. It is not completed in the case of interhospital transfers.

It may be possible to have both a medical and a trauma case together in one patient; if this is so then complete both trauma and medical sections.

5.1. Intent

- What was the aim behind the traumatic injury
- Select the appropriate box; only one selection should be made.

Intentional violence	Injury resulting from ≥1 persons attempting to harm another person. Includes unintended victims (i.e. stray bullets in an armed robbery). Includes sexual assault.
Legal intervention	Injury caused by / to police, military or security guards during law enforcement activities
Self-harm	Injury caused by a deliberate attempt to kill / harm self
Accidental injury	Non-deliberate injury to self or other person
Unknown	Specify in free text area

5.2. Mechanism of injury

- The cause, or mechanism, of injury is the way in which the person sustained the injury; how the person was injured; or the process by which the injury occurred. For this system, the cause of injury is the **underlying cause,** rather than the direct cause. The underlying cause is what starts the chain of events that leads to an injury. The direct cause is what produces the actual physical harm. The underlying and direct causes can be the same or different. For example, if a person cuts his or her finger with a knife, the cut is both the underlying and direct cause. However, if a child falls and hits his head on a coffee table, the fall is the underlying cause (the action that starts the injury event), and the contact with the table is the direct cause (the action that causes the actual physical harm).
- Complete the box using the appropriate code
- If the "other" code is used specify in the free text space
- If more than one code is accurate, complete the main mechanism of injury in the code box and the write the second code in the free text space.

UNDERLYING CAUSE / MECHANISM OF INJURY			
Category	**Detail**	**Code**	**Definition**
Fall	Same level	FAL1	Not syncope or other medical cause for falling. Only incidents where falling is the underlying cause / mechanism of injury.
	≤ 2 x patient's height	FAL2	
	> 2 x patient's height	FAL3	
Bite / sting	Animal	BITA	
	Human	BITH	
Blunt injury	Crush	BLU1	Not "crush injury" but being crushed by an object (e.g. exercise weights, block of concrete, sand)
	Struck by	BLU2	Propelled or held object moving toward patient
	Struck against	BLU3	The patient is thrown against an immobile / reasonably immobile object
Foreign body through natural opening that does not block the airway		BODY	Benign substance that by itself does not constitute a threat, but by its location in the body causes injury.
Asphyxia	Foreign body	FBAO	In airway
	Submergence	ASP1	Drowning / near drowning in water or other liquid
	Strangulation	ASP2	
	Smoke inhalation	SMOK	
	Oxygen deficient environment	O2DE	
Penetrating injury (cut, pierce, stab)	Struck by	PEN1	Propelled or held object moving toward patient
	Struck against	PEN2	The patient is thrown against an immobile / reasonably immobile object
Blunt or penetrating injury caused by operating machinery	Industrial	MACI	Butcher's meat slicers, jackhammers, drill presses
	Commercial	MACC	Escalators, lifts, etc
	Domestic	MACD	Lawn mowers, hand tools, etc
Gunshot		GSW1	Powder-charged weapons, not compressed air paint guns, BB guns or nail guns
Temperature exposure	Direct heat source	HEAT	Flame, steam, etc
	Hot environment	HOTT	High ambient temperature, either indoors / outdoors
	Direct cold source	COLD	
	Cold environment	COOL	Low ambient temperature, either indoors / outdoors
Electricity	Lightning	LIGH	Fatal or non-fatal
	Electrocution	ELEC	

Acute overexertion of body / part of body		WORK	Lifting, twisting, etc in sport, manual labour, etc.
Harmful substances	Poisoning	POIS	Ingestion, inhalation, absorption, injection of harmful chemical or toxin (biological or non-biological) including plants & marine life.
	Overdose	OD11	Legal or illegal drug / medication
	Skin damage	SKIN	Chemical burns, corrosion
Transportation / Road traffic accident	MVA – driver. Protrusion into passenger compartment	MAD1	Driver / passenger of a road vehicle – car, truck (excluding motorcycle). Where structural damage of the vehicle has occurred in the passenger compartment
	MVA – passenger. Protrusion into passenger compartment	MAO1	
	MVA – driver. No protrusion into passenger compartment	MAD2	Driver / passenger of a road vehicle. Where no structural damage of the vehicle has occurred in the passenger compartment
	MVA – passenger. No protrusion into passenger compartment	MAO2	
	MVA – pedestrian. Damage to vehicle	MVP1	Pedestrian collision with a road vehicle (including motorcycle & pedal cycle). Damage has occurred to the vehicle.
	MVA – pedestrian. No damage to vehicle	MVP2	Pedestrian collision with a road vehicle (including motorcycle & pedal cycle). No damage has occurred to the vehicle.
	Motorcyclist	MTBK	Driver of, or passenger on, a motor cycle
Other transport	Cyclist	BIKE	Pedal cyclist accident alone or with a motor vehicle or stationary object
	Train	TRAI	Occupant
		TRAP	Pedestrian
	Watercraft	BOAT	Occupant
	Aircraft	AERO	Occupant
	Other occupant	OTHO	Quads, Go-carts, cable cars
	Other pedestrian	OTHP	
Contact Sport		SPRT	Contact sport injuries. Does not include overexertion
Other	Other trauma not specified	OTHE	Where no specific category exists for the underlying cause.

5.3. Presenting Injury

- The presenting injury tells us what is wrong with the patient, what the main injuries are.
- Complete the box using the appropriate code
- If the "other" code is used then specify in the free text space
- If more than one code is accurate, complete the main presenting injury in the code box and the write the second code in the free text space.

Presenting injury	Code	Definition
Cardiac arrest (traumatic)	CART	
HEAD		
Head trauma – penetrating	HDPT	
Head trauma – blunt	HDBT	
FACIAL		
Eye injuries – chemicals / foreign body	EYEF	
Eye injury – penetrating	EYEP	
Eye trauma – blunt	EYEB	
Dental trauma	DENT	
Ear trauma – penetrating	EARP	
Ear trauma – blunt	EARB	
Facial trauma – penetrating	FACP	
Facial trauma – blunt	FACB	
NECK		
Neck trauma – penetrating	NECP	
Neck trauma – blunt	NECB	
Neck trauma – acceleration / deceleration injury	NECT	
THORAX		
Thoracic trauma – penetrating	THTP	
Thoracic trauma – blunt	THTB	
ABDOMEN / PELVIS		
Abdominal trauma – penetrating	ABDP	
Abdominal trauma - blunt	ABDB	
Genital / groin trauma– penetrating	GENP	
Genital / groin trauma- blunt	GENB	
Anal/Rectal trauma– penetrating	ANAP	
Anal/Rectal trauma- blunt	ANAB	
BACK		
Back pain – mechanical; lifting, stretching, etc	BACM	

Back trauma - penetrating	BACP	
Back trauma – blunt	BACB	
Back trauma – acceleration / deceleration injury	BACT	
EXTREMITIES		
Upper limb joint – sprain / twist / dislocation	UPLS	
Upper limb – fracture	UPLF	
Upper limb trauma - penetrating	UPLP	
Upper limb trauma - blunt	UPLB	
Upper limb amputation	UPLA	
Lower limb joint – sprain / twist / dislocation	LWLS	
Lower limb – fracture	LWLF	
lower limb trauma - penetrating	LWLP	
lower limb trauma - blunt	LWLB	
Lower limb amputation	LWLA	
AIRWAY / RESPIRATION		
Smoke / toxic gas inhalation	GASS	
ENVIRONMENT		
Burns	BURN	
Electrocution / other electrical injury	ELEC	
Lightning	LIGH	
Heat Exposure / Hyperthermia	HEAT	not pyrexia
Hypothermia	COLD	
Stings / bites –venomous	STIN	Any potentially venomous animal; i.e. snake, spider
Bites / Stings – non-venomous	BITE	Any non-venomous animal: dog, cat, human
Chemical Exposure	CHEM	
Drowning / Near Drowning	DROW	
OTHER TRAUMA		
Sexual assault / rape	RAPE	
Polytrauma	POLY	Traumatic injuries to more than one organ system
Major trauma – penetrating	MJTP	
Major trauma – blunt	MJTB	
Major trauma – unspecified	MJTU	
Minor trauma – unspecified	MNTU	
Other trauma	OTHE	

6. Medical

This section is only completed if it is a trauma patient. It is not completed in the case of interhospital transfers.

It may be possible to have both a medical and a trauma case together in one patient; if this is so then complete both trauma and medical sections.

6.1. Cause

- Select the appropriate box; only one selection should be made.

New condition	The patient has not suffered from this complaint before, or has not being diagnosed with illness previously
Pre-existing condition	The patient has this illness / complaint on an ongoing basis, but now has acute exacerbation or new symptom onset
Unknown	If the patient is unable to give a medical history and no-one present can confirm if the patient has had the presenting medical condition before.

6.2. Chief complaint

- The chief (or presenting) complaint is a brief reason of why a patient requires the EMS.
- Complete the box using the appropriate code
- If the "other" code is used then specify in the free text space
- If more than one code is accurate, complete the main chief complaint in the code box and the write the second code in the free text space.

Chief Complaint	Code	Definition
MEDICAL AETIOLOGY		
1. AIRWAY / BREATHING		
Shortness of breath / respiratory distress	MA11	
Respiratory arrest	MA12	
Cough	MA13	
Hyperventilation	MA14	
Haemoptysis	MA15	
2. CIRCULATION		

Cardiac arrest (non-traumatic)	MC11	Cardiac arrest presumed to be of non-traumatic cause
Chest pain	MC12	Unspecified, non-traumatic cause
Palpitations	MC13	
3. LEVEL OF CONSCIOUSNESS		
Syncope	ML11	Collapse of non-traumatic cause
Anxiety	ML12	
Violent behaviour	ML13	Not of any other specified cause, e.g. trauma, drug OD
Bizzare / paranoid behaviour	ML14	Not of any other specified cause, e.g. trauma, drug OD
Altered level of consciousness	ML15	Not of any other specified cause, e.g. trauma, drug OD
Seizure	ML16	
Gait disturbance / Ataxia / Tremor	ML17	
Extremity weakness / Symptoms of CVA	ML18	
Sensory loss / Parasthesias	ML19	
4. HEAD, NECK & FACE		
Headache	MH11	
Ear complaint (non-traumatic)	MH12	
Sore throat / dysphagia	MH13	
Neck complaint (non traumatic)	MH14	
Facial / dental pain (non-traumatic)	MH15	
Nasal complaint (non-traumatic)	MH16	
Eye complaints (non-traumatic)	MH17	
5. TORSO – ABDO, PELVIS, THORAX, BACK		
Abdominal pain (non-traumatic)	MT11	
Diarrhea	MT12	
Groin complaint (non-traumatic)	MT13	
Nausea and/or vomiting	MT14	
Vomiting blood	MT15	
Blood in stool / Melena	MT16	
Hematuria	MT17	
Back pain – non traumatic	MT18	
6. OBSTETRICS / GYNAECOLOGY		
Gynaecological complaints (non-pregnancy, non-trauma)	OG11	
Other Pregnancy issues	OG12	
Imminent delivery / labour	OG13	
7. OTHER		
Upper extremity pain	MO11	
Lower extremity pain	MO12	
Localized swelling/redness / rash non specific skin complaint – non traumatic	MO13	
Fever	MO14	
Hyperglycemia	MO15	
Hypoglycemia	MO16	
General weakness / unwellness	MO17	
Unspecified infant complaints not detailed more specifically in another category	MO18	
Minor complaints – unspecified (non traumatic)	MO19	
Major complaint - unspecified	MO20	
EXTERNAL AETIOLOGY		
1. TOXINS		
Substance misuse / Intoxication	ET11	
Overdose	ET12	
Substance withdrawal	ET13	
Allergic reaction	ET14	
Noxious inhalation	ET15	
Chemical exposure (excluding inhalation)	ET16	
2. ENVIRONMENT		
Hyperthermia	EE11	
Electrical injury	EE12	
Hypothermia	EE13	
Exposure to communicable disease	EE14	
Blood and body fluid exposure	EE15	
3. OTHER		
Transportation for referral / appointment	EO13	If not otherwise specified in a more specific category
Medical device problem	EO14	
Post-operative complications	EO15	
Respiratory foreign body	EO16	Foreign body in respiratory tract, part unspecified

Other – not specified	OTHE	General category if not otherwise more detailed.

6.3. EMS condition

- The EMS condition is the provisional / working diagnosis made following the assessment of a patient. While it is accepted that this diagnosis is not always accurate, it is required for specific prehospital management (e.g. medications for AMI or asthma; spinal immobilisation) and referral / transportation to a specific hospital (e.g. 24-hour x-ray facilities; CCU).
- Complete the box using the appropriate code
- If the "other" code is used then specify in the free text space
- If more than one code is accurate, complete the main EMS condition in the code box and the write the second code in the free text space.

Provisional Diagnosis / EMS Condition	Code	Definition
HEAD		
Altered Level of Consciousness – non-traumatic, unknown reason	LOCM	
Behavioural/Psychiatric Disorder / anxiety, etc	PSYC	
Non Traumatic Headache	HEAD	
Stroke / CVA	STRO	
Seizure	SIEZ	
Syncope / dizziness	SYNC	
Paralysis	PARA	
Movement disorder – ataxia. Etc	MOVE	
FACIAL		
Eye problems – non traumatic	EYEM	
Dental problem – non traumatic	DENM	
Ear problem – non traumatic	EARM	
Other non-traumatic facial disorder / concern	FACM	
NECK		
Other neck pain – non-traumatic	NECK	
Other neck problem – non-traumatic	NECM	
THORAX		
Chest pain – cardiac	CAR1	
Chest pain – non cardiac, non-traumatic	CHST	
Abnormal cardiac rhythm	ARRY	
Other cardiac problem	CAR2	
ABDOMEN		
Abdominal Pain – non-traumatic	ABD1	
Other abdominal problems – non-traumatic	ABD2	
BACK		
Back pain – other non-traumatic	BACK	
EXTREMITIES		
Upper limb problem / pain – non traumatic	UPLM	
Lower limb – problem / pain – non traumatic	LWLM	
AIRWAY / RESPIRATION		
Foreign body airway obstruction	FBAO	
Smoke / toxic gas inhalation	GASS	
Asthma	ASTH	
Other respiratory distress	RESP	
ENDOCRINE		
Diabetic complications - normoglycaemia	DIAB	
Hypoglycaemia	HYPO	
Hyperglycaemia	HYPE	
Other endocrine disorder	ENDO	
OBS / GYN		
Pregnancy – labour	OBS1	
Pregnancy complications – not labour	OBS2	
Vaginal haemorrhage – not pregnancy related	GYN1	
Other gynaecological problems	GYN2	
ENVIRONMENT		
Heat Exposure / Hyperthermia – not pyrexia	HEAT	
Hypothermia	COLD	
Chemical Exposure	CHEM	
Poisons (all routes)	POIS	

Drug / medication OD	DRUG	
Alcohol OD / intoxication	ALCO	
Allergic Reaction	ALER	
MEDICAL COMPLICATIONS		
Medical Device Failure	MEDF	
Post-Operative Procedure Complications	COMP	
Infectious Diseases requiring Isolation/Public Health Risk	DISE	
Medication side effects	MEDS	
OTHER MEDICAL		
Cardiac Arrest	CARM	
Respiratory arrest	RESA	
Severe Dehydration	DEHY	
Fever	TEMP	
Malaise	MALA	
Pain (Severe) – non specific, non trauma	PAIN	
Other – non traumatic	OTHE	

7. Interhospital Transfer

- To be completed in the case of all interhospital transfers
- The codes are listed in ascending order, thus if two codes are applicable, select the appropriate code that is furthest down the list.
- If "other" is selected please specify in the free text space

INTER-FACILITY TRANSPORT	Code	Definition
Patient monitoring / transportation - to step down facility	STEP	
Patient monitoring / transportation – to higher level of care	HLOC	
Isolation required	ISOL	
Suctioning/Oxygen/IV fluids required	AMBO	
IV drug infusions / invasive airway in place	MICU	
Other	OTHE	

8. Location

8.1. Location type

- Select the appropriate box; only one selection should be made.
- If "other" is selected, please specify.

Agricultural	A farm
Commercial	Offices (including government departments), shops, schools, restaurants, etc
Health	Hospitals, clinics, doctors rooms, etc. this should be selected for both primary responses and transfers from health care facilities
Industrial	Manufacturing, mining, etc
Park	Outside recreational areas such as parks, beaches, etc.
Police stations	
Residence	Includes formal & informal housing, old age homes, homes for the disabled, prisons, etc.
Road	Any road – highway, suburb road, etc when the patient is found outside of a building / private property. Also includes railway stations
Other	Please specify

8.2. Suburb

- Codes dependant on the particular region.

8.3. Transferring hospital

- This is used for interhospital transfers only; the hospital that the patient is coming from.
- Use the code list found in section 10.2

9. Response and Rescue type

9.1. Response type

- Select the appropriate box; only one selection should be made

Primary	Initial vehicle(s) dispatched, this excludes inter-facility transfers
Transfer	Transfers between health care institutions; e.g. hospices, clinics, hospitals. Excludes old age homes unless patient is in a clinic environment in the old age home.
Assistance	Request for assistance, medical rescue or additional staff and transport vehicles.

9.2. Rescue type

- Complete this section only if rescue occurred.
- Indicate the type of rescue activity, if any, that was performed to access or extricate the patient; e.g. motor vehicle extrication, fire suppression, rope rescue, etc.
- Where multiple types of rescue were performed, complete the main code in the boxes and the secondary code in the free text space.
- Where "other" is selected, please specify.

CARS	Motor vehicle extrication, heavy or light
ROPE	Any type of rope access required
USAR	Urban Search and Rescue, any structural collapse / trench rescue
WSAR	Wilderness search and rescue, any search outside the built up environment
CSPC	Rescue in a confined space, e.g. drain tunnels, etc
AQUA	Water rescue; sea, rivers, lakes
FIRE	If fire suppression activities were needed to secure the scene or the patient
OTHE	Specify type or types

10. Transport and Destination

10.1. Transport

- Select the appropriate box; only one selection should be made.
- Indicates the method the patient was transported from the scene.

Air	Air medical services were used to transport the patient
Ambulance	A private or state ambulance transported the patient
Private transport	The patient went by private transport, metered-taxi or public transport
Police	The SAPS or Metro police transported the patient
No transport	The patient elected to remain at the incident
Other	Use the free text space to specify

10.2. Destination

- Complete the box using the appropriate code
- Complete this even if patient is not transported by ambulance but you are aware of the destination if the patient goes by another form of transport.

Destination	Code	Comment
Residence	HOME	Private residence, old age home, etc
Clinic	PRHC	Provincial, municipal or private primary health care or occupational health clinic
Community health centre	COHC	Government or private clinic-type centres that while not hospitals do offer a larger range of services than PHC clinics or doctors rooms and have a medical doctor present; e.g. minor procedures, X-rays, resuscitation, etc
Doctor's rooms	DOCS	Doctors rooms that are not in a hospital / clinic type environment
Care facility	CARE	Hospice or step-down facility
Mortuary	MORG	Either government medico-legal laboratory or a private mortuary
Other	OTHE	
No Transport	NOTR	
ETHEKWINI HOSPITALS		
Addington	ADDI	
Arena Park	AREN	
Charles James (SANTA)	CHRL	
Chatsmed	CHAT	
City	CITY	
Clairwood	CLWD	
Crompton	CROM	
Dayanand Garden	DAYA	
Don McKenzie (SANTA)	DMCK	
Durdoc	DURD	
Ekuhlengeni	EKUH	
Entabeni	ENTA	
Fort Napier	FORT	
FOSA	FOSA	
Hillcrest	HILL	
Inkosi Albert Luthuli Central	IALC	
Isipingo	ISIP	
King Edward VIII	KEDW	
King George V	KGEO	

Kingsway	KING	
Lancet	LANC	
Mahatma Gandhi	GAND	
McCord	MCOR	
Mount Edgecombe	MONT	
Nu-Shifa	SHIF	
Osindisweni	OSIN	
Parklands	PARK	
Prince Mshiyeni	PMSH	
RK Khan	KHAN	
St Aiden's	SAID	
St Augutine's	SAUG	
St Mary's	MARY	
Umbongintwini	UMBO	
Umhlanga	UMHL	
Victoria	VICT	
Wentworth	WENT	
Westville	WEST	
Wyebank	WYEB	
UGU HOSPITALS		
Dunstan Farrell (SANTA)	DUNS	
GJ Crookes	GJCR	
Hibiscus	HIBI	
Margate	MARG	
Murchison	MRCH	
Port Shepstone	PORT	
St Andrews	SAND	

11. Vital signs

- Initial vital signs, prior to any management of the patient.
- Only record if taken, do not guess.

Pulse	Actual heart rate, over 1 minute recorded in a 3-digit box
Respiration	Actual rate, over 1 minute recorded in a 3-digit box
Haemoglucose	Actual blood sugar test with decimal points in mmol/l, recorded in a 3-digit box.
Blood Pressure	Actual in mmHg, recorded in a 6-digit box, systolic and diastolic
Burns	Actual % burns estimated on rule-of-9's, recorded in a 2-digit box Only 2nd and 3rd degree (deep partial and full-thickness) burns are considered Rule of nines: • Entire head: 9% • Each arm: 9% • Each leg: 18% • Chest & abdomen: 18% • Back: 18% • Perineum: 1%

12. Declaration of Death

- Select the appropriate box; only one selection should be made
- Use this category if the patient is obviously dead and no cardio-pulmonary resuscitation is attempted. If CRP is performed then use either the "TRAUMA" or "MEDICAL" sections.
- Paramedics are not forensic pathologists and are therefore not expected to be 100% accurate. This is your professional opinion based on your assessment of the scene and patient.

Trauma	If the cause for death appears to be traumatic; intentional, accidental or self-inflicted.
Non-trauma, natural	If the cause of death appears to be of a medical condition following its natural course.
Non-trauma, unnatural	If the cause of death appears non-traumatic but does not appear to be the natural progression of a disease.
Unknown	If it is not possible for the paramedic to identify at all whether death is of traumatic or non-traumatic cause.

13. Medical History

- Select the appropriate box(es); multiple selections can be made
- These are elements of the patient's medical history and not necessarily conditions that the patient is currently presenting with, but does include current history elements. If there are any other history items that you feel are relevant, please tick the "other" and specify in the free text space.
- This should not be a guess, but information gained from the patient or family.

Asthma	
Cancer	
Cardiac disease	Ischaemic heart disease, chronic congestive failure, previous myocardial infarction or angina
Chronic lung disease	Excluding asthma & TB
Diabetes	
HIV	Care must be taken not to infringe on confidentiality rights; i.e. if the patient doesn't volunteer this information then do NOT solicit it and do NOT assume.
Hypertension	
Possible intoxication	When the patient appears to be under the influence of alcohol or drugs
Pre-existing paralysis	Quad-/ hemi-/ para-plegia
TB	
Other	Specify. This includes all relevant medical / surgical patient history

14. AVPU

- Level of consciousness
- Select the appropriate box; only one selection should be made.
- On initial contact, prior to any patient management

Alert	Patient is awake; maybe confused
Voice response	Patient only shows signs of consciousness when specifically spoken to
Pain response	Patient only shows signs of consciousness when given a pain stimulus
Unresponsive	Patient is not responsive to any stimuli

15. Skin temperature assessment

- Select the appropriate box; only one selection should be made.
- A tactile assessment of the skin should be done, and the appropriate box selected. If an actual temperature is taken, please select the appropriate category.

16. Clinical presentation

- This is the initial presentation of the patient as you find on scene.

Burns: Inhalation / facial	Only 2nd and 3rd degree (deep partial and full-thickness) facial burns are considered **OR** suspected inhalation burns	
Burns: circumferential	Burns completely around a limb, neck or torso	
Confusion / aggression	If the patient is alert or responsive to voice but is aggressive or appears confused.	
Coughing / vomiting blood		
Current pregnancy		
Current seizure	Not a history of seizures, but a seizure that occurs in your presence	
Fracture / dislocation		
Mobility: walking	Requires no assistance	Place infants and small children, who are usually carried by the paramedic or parent, in the appropriate category based on your assessment.
Mobility: with help	Is able to walk if assisted. Include patients usually in a wheelchair if their degree of mobility has not changed.	
Mobility: stretcher / immobile	Includes patients who can walk but are immobilised due to suspected spinal injury.	
Neurological deficit	Distal weakness, paralysis, numbness, "pins and needles", etc. Does **NOT** include confusion or aggression.	
Paediatrics: inappropriate history	When the history given does not make sense when considered with the injuries sustained, or the age and development of the patient.	
Paediatrics: inappropriate behaviour	When the behaviour of the patient appears abnormal in terms of injury, age and development, and the presence of a parent, caregiver or stranger (paramedic)	
Pain: mild	This is based on the patients' assessment of their own pain	
Pain: moderate		
Pain: severe		
Persistent vomiting	Only when this occurs while you are on scene or in transport with the patient	
Respiratory distress	Dyspnoea (a feeling of difficulty in breathing), accessory muscle use, tachypnoea or hyperventilation	
Uncontrolled haemorrhage	Inability of the paramedic to effectively stop external haemorrhage, or suspected internal haemorrhage.	

17. Signatures

- Simply for control and validation purposes
- Paramedic signs on completion of the form
- Data capturer signs during electronic capture of the form

Appendix I: Approval from KwaZulu-Natal Department of Health

HEALTH
KwaZulu-Natal

Natalia, 330 Langalibalele Street, Pietermaritzburg, 3201
Private Bag X 9051, Pietermaritzburg, 3200
Tel.: 033 395 3184/3003, Fax.: 033 345 3527
Email: thiloshini.govender@kznhealth.gov.za
www.kznhealth.co.za

Enquiries : Dr T. Govender
Telephone : (033) 395 3184

02 August 2006

Mr James Marcus Bowen
Department of Emergency Medical care & Rescue
Durban University of Technology
P.O. Box 1334
DURBAN
4000

Fax: 031-3085201

RE: RESEARCH APPROVAL:

Development of a tool to define the population of emergency medical care users in South Africa.

Thank you for submitting the above protocol for review by the KwaZulu Natal Department of Health. The protocol is hereby approved.

Please ensure the following:

1. Contact the district and institutional management teams for permission prior to commencing with fieldwork and
2. Provide this office with six monthly progress, interim and final reports arising from this study

Thank You

Dr T Govender
Principal Specialist
Epidemiology Unit

REFERENCES

Adams, B.D. & Whitlock, W.L. (2004). "Utstein style" spreadsheet and database programs based on Microsoft Excel® and Microsoft Access® software for CPR data management of in-hospital resuscitation. *Resuscitation,* 61(1): 37-40.

Adnet, F. & Lapostolle, F. (2004). International EMS Systems: France. *Resuscitation,* 63(1): 7-9.

American Medical Directors Association (AMDA) (2003). *Position Statement H03: Declaration of Death.* [http://www.amda.com/governance/resolutions/h03.cfm] [Accessed 29 March 2008]

Atkin, C., Freedman, I., Rosenfeld, J.V., Fitzgerald, M. & Kossmann, T. (2005). The evolution of an integrated State Trauma System in Victoria, Australia. *Injury,* 36(11), 1277-87.

Aygencel, G., Karamercan, M., Ergin, M. & Telatar, G. (2008). Review of traffic accident cases presenting to an adult emergency service in Turkey. *Journal of Forensic and Legal Medicine,* 15, 1-6.

Bateman, C. (2006). New triage system halves mortalities. *South African Medical Journal,* 96(9): 770 - 2.

Billittier, A., Moscati, R., Janicke, D., Lerner, E., Seymour, J. & Olsson, D. (1996). A multisite survey of factors contributing to medically unnecessary ambulance transports. *Academic Emergency Medicine,* 3(11): 1046-52.

Boutron, I., Moher, D., Tugwell, P., Giraudeau, B., Poiraudeau, S., Nizard, R. & Ravaud, P. (2005). A checklist to evaluate a report of a nonpharmacological trial (CLEAR NPT) was developed using consensus. *Journal of Clinical Epidemiology,* 58(12): 1233-40.

Bradshaw, D., Groenewald, P., Laubscher, R., Nannan, N., Nojilana, B., Norman, R., Pieterse, D. & Schneider, M. (2003). *Initial Burden of Disease Estimates for South Africa, 2000.* Cape Town Medical Research Council

Brady, J.W.J., Hennes, H., Wolf, A., Hall, K.N. & Davis, M. (1996). Pattern of basic life support ambulance use in an urban pediatric population. *The American Journal of Emergency Medicine,* 14(3): 250-3.

Brender, J., Nohr, C. & McNair, P. (2000). Research needs and priorities in health informatics. *International Journal of Medical Informatics,* 58-59: 257-89.

Brokaw, J., Olson, L., Fullerton, L., Tandberg, D. & Sklar, D. (1998). Repeated ambulance use by patients with acute alcohol intoxication, seizure disorder, and respiratory illness. *The American Journal of Emergency Medicine,* 16(2), 141-4.

Brown, E. & Sindelar, J. (1993). The emergent problem of ambulance misuse. *Annals of Emergency Medicine,* 22(4): 646-50.

Burneo, J. & Martin, R. (2004). Reporting race/ethnicity in epilepsy clinical trials. *Epilepsy and Behaviour,* 5(5): 743-5.

Callaham, M. (1997). Quantifying the Scanty Science of Prehospital Emergency Care. *Annals of Emergency Medicine,* 30, 785-90.

Camasso-Richardson, K., Wilde, J. & Petrack, E. (1997). Medically unnecessary pediatric ambulance transports: a medical taxi service? *Academic Emergency Medicine,* 4(12): 1137-41.

Cambridge University Press, (2008). Cambridge Advanced Learner's Dictionary. [http://dictionary.cambridge.org/] [Accessed 28 March 2008]

Canto, J.G., Zalenski, R.J., Ornato, J.P., Rogers, W.J., Kiefe, C.I., Magid, D., Shlipak, M.G., Frederick, P.D., Lambrew, C.G., Littrell, K.A. & Barron, H.V. (2002). Use of Emergency Medical Services in Acute Myocardial Infarction and Subsequent Quality of Care: Observations From the National Registry of Myocardial Infarction 2. *Circulation,* 106(24): 3018-23.

Centers for Disease Control and Prevention (CDC) (2007). *Definitions for WISQARS™ Nonfatal.* [http://www.cdc.gov/ncipc/wisqars/nonfatal/definitions.htm] [Accessed 28 March 2008]

Coats, T.J. & Goode, A. (2001). Towards improving prehospital trauma care. *The Lancet,* 357(9274): 2070.

Colquhoun, M., Davis, C., Harris, S., Harris, R. & Chamberlain, D. (2004). Public access defibrillation - designing a universal report form and a database for a national programme. *Resuscitation,* 61(1): 49 - 54.

Cramer, C.K., Epstein, J.B., Sheps, S.B., Schechter, M.T. & Busser, J.R. (2002) Modified Delphi survey for decision analysis for prophylaxis of post-radiation osteonecrosis. *Oral Oncology,* 38(6): 574-83.

Cummins, R.O. (1993) The Utstein style for uniform reporting of data from out-of-hospital cardiac arrest. *Annals of Emergency Medicine,* 22(1): 37-40.

Department of Health (DOH), 2000. *The Primary Health Care Package for South Africa – a set of norms and standards.* National Department of Health, South Africa [http://www.doh.gov.za/docs/policy/norms/full-norms.html#norms] [Accessed 25 March 2008]

Dick, W.F. & Baskett, P.J.F. (1999) Recommendations for uniform reporting of data following major trauma -- the Utstein style: A report of a Working Party of the International Trauma Anaesthesia and Critical Care Society (ITACCS). *Resuscitation,* 42(2): 81-100.

Dickinson, E.T., Verdile, V.P., Kostyun, C.T. & Salluzzo, R.F. (1996) Geriatric Use of Emergency Medical Services. *Annals of Emergency Medicine,* 27(2): 199-203.

Doull, D. (2005) *Personal communication* Bowen, J.M. June 2005. Mr D Doull was, at the time of conversation, the operations manager for STAR in KZN. STAR is an aeromedical EMS provider.

Downing, A., Wilson, R. & Cooke, M. (2005) Linkage of ambulance service and Accident and Emergency Department data: a study of assault patients in the west midlands region of the UK. *Injury,* 36(6): 738-44.

Durch, J.S. & Lohr, K.N. (1993) *Emergency Medical Services for Children*. Washington, National Academy Press.

Engelbrecht, B., Daviaud, E., Shaw, V., Couper, I. & Claassens, L. (2000) A Barometer of District Hospital Management. Durban, Health Systems Trust.

Epidemiology Unit 2006 *KwaZulu-Natal epidemiology bulletin: Burden of mortality in KwaZulu-Natal*. KwaZulu-Natal Department of Health.

Farley, C.L., Tharpe, N., Miller, L. & Ruxer, D.J. (2006) Women's Health Care Minimum Data Set: Pilot Test and Validation for Use in Clinical Practice. *Journal of Midwifery & Women's Health,* 51(6): 493-501.

Ferguson, N.D., Davis, A.M., Slutsky, A.S. & Stewart, T.E. (2005) Development of a clinical definition for acute respiratory distress syndrome using the Delphi technique. *Journal of Critical Care,* 20(2): 147-54.

Fuhri, P. (2005) *Personal communication* Bowen, J.M. 31 August 2005. Appropriate use of EMS. Mr. P. Fuhri is the Director of Emergency Medical Services and Disaster Management in the South African National Department of Health.

Gardner, G.J. (1990) The use and abuse of the emergency ambulance service: some of the factors affecting the decision whether to call an emergency ambulance. *Archives of Emergency Medicine,* 7(2): 81-9.

Gentilini, P., Bernardi, M., Bolondi, L., Craxi, A., Gasbarrini, G., Ideo, G., Laffi, G., La Villa, G., Salerno, F., Ventura, E., Pulazzini, A., Segantini, L. & Romanelli, R.G. (2004) The rational use of albumin in patients with cirrhosis and ascites: A Delphi study for the attainment of a consensus on prescribing standards. *Digestive and Liver Disease,* 36(8): 539-46.

Gibbs, T. (2005) *Personal communication* Bowen, J.M. 1 September 2005. Ms. T Gibbs is the Communications Centre Manager for ER24 (private EMS) in Durban.

Gomes, E., Araujo, R., Soares-Oliveira, M. & Pereira, N. (2004) International EMS systems: Portugal. *Resuscitation,* 62(3): 257-60.

Gottschalk, S. 2007 Validation of the Modified Early Warning Score as a Triage Instrument in the Western Cape Private Health Care Setting. *Emergency Medicine in the Developing World.* Cape Town, South Africa.

Govindarajan, A. & Schull, M. (2003) Effect of socioeconomic status on out-of-hospital transport delays of patients with chest pain. *Annals of Emergency Medicine,* 41, 481-90.

Grafstein, E., Unger, B., Bullard, M. & Innes, G. (2003) Canadian Emergency Department Information System (CEDIS) Presenting Complaint List (Version 1.0). *Canadian Journal of Emergency Medicine,* 5(1): 27-34.

Green, J. & Thorogood, N. (2006) *Qualitative Methods for Health Research,* London, Sage.

Greenbaum, T. (2000) *Moderating focus groups: A practical guide for group facilitation,* California, Sage Publications.

Griffith, L.E., Hogg-Johnson, S., Cole, D.C., Krause, N., Hayden, J., Burdorf, A., Leclerc, A., Coggon, D., Bongers, P., Walter, S.D. & Shannon, H.S. (2007) Low-back pain definitions in occupational studies were categorized for a meta-analysis using Delphi consensus methods. *Journal of Clinical Epidemiology,* 60(6): 625.e1-23.

Haller, G., Myles, P.S., Stoelwinder, J., Langley, M., Anderson, H. & McNeil, J. (2007) Integrating Incident Reporting into an Electronic Patient Record System. *Journal of the American Medical Informatics Association,* 14(2): 175-81.

Hauswald, M. & Yeoh, E. (1997) Designing a prehospital system for a developing country: Estimated cost and benefits. *The American Journal of Emergency Medicine,* 15(6): 600-3.

Havemann, R. & Kearney, M. (2006) Where you live matters: urbanisation and labour market outcomes. *Accelerated and shared growth in South Africa: determinants, restraints and opportunities.* The Birchwood Hotel and Conference Centre, Johannesburg, South Africa, Development Policy Research Unit, University of Cape Town.

Health Professions Council of South Africa (HPCSA) (Undated) *Professional Board for Emergency Care Practitioners* Website. Health Professions Council of South Africa. [http://www.hpcsa.co.za/hpcsa/default.aspx?id=64] [Accessed 22 February 2008]

Health Systems Trust (HST). 2003. *Summary Bulletin 8 - DHS-LG Discussion List: Minor Ailments.* Durban, Health Systems Trust [http://www.hst.org.za/generic/63] [Accessed 25 March 2007]

Health Systems Trust (HST). 2007. South African Health Review. Durban: HST.

Holstein, J. & Gubrium, J. (1997) Active interviewing. IN Silverman, D. (Ed.) *Qualitative research: Theory, Method and practice.* California, Sage Publications.

Hsiao, A.K. & Hedges, J.R. (1993) Role of the emergency medical services system in regionwide health monitoring and referral. *Annals of Emergency Medicine,* 22(11): 1696-702.

Hughes, I. (2006) Neonatal Critical Care Minimum Data Set (NCCMDS). *Journal of Neonatal Nursing,* 12(6): 200-2.

Hunt, J.P., Baker, C.C., Fakhry, S.M., Rutledge, R.R., Ransohoff, D. & Meyer, A.A. (1999) Accuracy of administrative data in trauma. *Surgery,* 126(2): 191-7.

Hutchinson, S.A. (1989) Getting started on a study. IN Wilson, H.S. (Ed.) *Research in Nursing.* 2nd ed. Redwood City, Addison-Wesley.

Jarrett, C. (2000a) Understanding the costs of data capture. *CIMTECH 2000.* Effortmark Limited, United Kingdom.

Jarrett, C. 2000b *Designing usable forms: the three-layer model of the form* [http://www.formsthatwork.com/articlespapers/form.asp] [Accessed 18 February 2008]

Jarrett, C. (2005a) *Personal communication* Bowen, J.M. 24 August 2005. Forms that work comment or query. Ms. C Jarrett is an independent forms consultant and usability expert.

Jarrett, C. 2005b *Five factors for choosing software* [http://www.formsthatwork.com/articlespapers/5f.asp] [Accessed 18 February 2008]

Jerkins, D. & Smith, T. (1994) Applying Delphi methodology in family therapy research. *Contemporary Family Therapy,* 16 (5), 411-30.

Kawakami, C., Ohshige, K., Kubota, K. & Tochikubo, O. (2007) Influence of socioeconomic factors on medically unnecessary ambulance calls. *BMC Health Services Research,* 7(1), 120-9.

Keeney, S., Hasson, F. & McKenna, H.P. (2001) A critical review of the Delphi technique as a research methodology for nursing. *International Journal of Nursing Studies,* 38(2): 195-200.

Kleinbeck, S.V.M. (1996) In Search of Perioperative Nursing Data Elements. *AORN,* 63(5): 926-31.

Krause, M.W., Viljoen, M.J., Nel, M.M. & Joubert, G. (2006) Development of a framework with specific reference to exit-level outcomes for the education and training of South African undergraduate physiotherapy students. *Health Policy,* 77(1): 37-42.

KwaZulu-Natal Department of Health (KZN-DOH) 2008. *Health Statistics available for KwaZulu-Natal* Pietermartizburg KwaZulu-Natal Deaprtment of Health [http://www.kznhealth.gov.za/healthstatistics.htm] [Accessed 25 March 2005]

Langhelle, A. & Mellesmo, S. (2000) Anesthesiologist-manned helicopter missions to trauma patients in rural Norway. Evaluation of 5 years of prehospital medical activity at Dombaas. *Air Medical Journal,* 19(3): 106-7.

Lottering, W. (2005) *Personal communication* 26 October 2005. Ms. W Lottering is a data capturer in the emergency communication centre for the Ethekwini district of the KZN EMRS; she has had 13 years of experience as an operational ECP and in the communications centre.

Macfarlane, C., Loggerenberg, C. & Kloeck, W. (2005) International EMS systems in South Africa: past, present, and future.. *Resuscitation,* 64(2): 145-8.

Marco, A.P., Buchman, D. & Lancz, C. (2003) Influence of form structure on the anesthesia preoperative evaluation. *Journal of Clinical Anesthesia,* 15(6): 411-7.

Marsden, A.K. (1995) Getting the right ambulance to the right patient at the right time. *Accident and Emergency Nursing,* 3(4): 177-83.

Massachusetts ambulance trip record information system (MATRIS), 2006. Massachusetts Government, USA [http://www.mass.gov/?pageID=eohhs2terminal&&L=5&L0=Home&L1=Government&L2=Departments+and+Divisions&L3=Department+of+Public+Health&L4=Programs+and+Services+A+-+J&sid=Eeohhs2&b=terminalcontent&f=dph_injury_surveillance_g_program_about&csid=Eeohhs2] [Accessed 19 March 2008]

Maybloom, B. & Champion, Z. (2003) Development and implementation of a multi-centre information system for paediatric and infant critical care. *Intensive and Critical Care Nursing,* 19(6): 326-41.

Mears, G., Ornato, J. & Dawson, D. (2002) Emergency medical services information systems and a future EMS national database. *Prehospital Emergency Care*. 6(1): 123-30.

Melton, J.T.K., Jain, S., Kendrick, B. & Deo, S.D. (2007) Helicopter Emergency Ambulance Service (HEAS) transfer: an analysis of trauma patient case-mix, injury severity and outcome. *Annals of The Royal College of Surgeons of England,* 89(5): 513-6.

Merriam-Webster, 2007. *Merriam-Webster online medical dictionary.* [http://medical.merriam-webster.com/] [Accessed 29 March 2008]

Miro, J., Huguet, A. & Nieto, R. (2007) Predictive Factors of Chronic Pediatric Pain and Disability: A Delphi Poll. *The Journal of Pain,* 8(10): 774-92.

Municipal Demarcation Board (MDB) (2006). *Municipalities of South Africa* [http://www.demarcation.org.za/] [Accessed 28 March 2008]

National Center for Health Statistics (NCHS), Undated. *Visits to Hospital Emergency Departments: Number, Percent Distribution, and Annual Rate by Type of Visit, Age, Sex, and Race. United States, 1992-2004,* US Department of Health and Human Services: National Centre for Health Statistics [http://209.217.72.34/aging/TableViewer/tableView.aspx] [Accessed 18 February 2007]

National Emergency Medical Services Information System (NEMSIS), 2005. [http://www.nemsis.org/] [Accessed 18 February 2007]

National Emergency Medical Services Information System (NEMSIS). 2006. *NHTSA Data Dictionary Version 2.2.1.* [http://www.nemsis.org/softwareDevelopers/downloads/datasetDictionaries.html] [Accessed 28 March 2008]

National Highway Traffic Safety Administration (NHTSA), 1993. *Emergency medical services outcomes evaluation.* U.S. Department of Transportation. [http://www.nhtsa.dot.gov/people/injury/ems/EMSOE/5_findings.htm] [Accessed 29 March 2008]

National Highway Traffic Safety Association (NHTSA), 2006. *EMS Update* [http://www.nhtsa.dot.gov/staticfiles/DOT/NHTSA/Traffic%20Injury%20Control/Articles/Associated%20Files/EMS_SummerUpdate.pdf] [Accessed 18 February 2008]

Nawar, E.W., Niska, R.W. & Xu, J. (2007). National Hospital Ambulatory Medical Care Survey: 2005 Emergency Department Summary. *Advance data.* [http://www.cdc.gov/nchs/data/ad/ad386.pdf] [Accessed 2 April 2008].

Owen, R.C. (2005) *Personal communication* Bowen, J.M. 20 June 2005. Mr. R C Owen was, at the time of communication, the Clinical Director at Surrey Health Trust Ambulance Service, Surrey, England.

Owen, R.C. & Dimopoulos, G. (1994) An analysis of advanced life support in the greater Durban area. *Trauma and Emergency Medicine*, 1053-57.

Palazzo, F., Warner, O., Harron, M. & Sadana, A. (1998) Misuse of the London ambulance service: How much and why? *Journal of accident and emergency medicine,* 15(6): 368-70.

Paldi, Y., Porath, A., Friedman, L. & Mozes, B. (1995) Factors Associated with Inappropriate Hospitalization in Medical Wards: a Cross-sectional Study in Two University Hospitals. *International Journal for Quality in Health Care,* 7(3): 261-5.

Pandit, N. (1996) The Creation of Theory: A Recent Application of the Grounded Theory Method. *The Qualitative Report,* 2(4). [http://www.nova.edu/ssss/QR/QR2-4/pandit.html] [Accessed 2 April 2008].

Patton, M. (1987) *How to use qualitative methods in evaluation,* California, Sage Publications.

Paulos, R. (2005) *Personal communication* Bowen, J.M. 9 August 2005. Mr. R Paulos is a data entry service supervisor at the University of Iowa, Biostatistics consulting centre.

Payne, K., Nicholls, S.G., Mcallister, M., Macleod, R., Ellis, I., Donnai, D. & Davies, L.M. (2007) Outcome measures for clinical genetics services: A comparison of genetics healthcare professionals and patients' views. *Health Policy,* 84(1): 112-22.

Phelps, M.A., Rodriguez, R.M., Passanante, M., Dresden, G. & Kriza, K. (2002) EMS activation in a cohort of critically ill patients. *Journal of Emergency Medicine,* 22(2): 127-31.

Pillay, Y., Mccoy, D. & Asia, B. (2001) *The District Health System in South Africa: Progress made and next steps.* [http://www.doh.gov.za/docs/policy/dhsystem.html] [Accessed 2 April 2008]

Polit, D.F. & Beck, C.T. (2006) *Essentials of nursing research: methods, appraisals, and utilization,* 6th ed. Philadelphia, Lippincott.

Pollock, D.A., Adams, D.L., Bernardo, L.M., Bradley, V., Brandt, M.D., Davis, T.E., Garrison, H.G., Iseke, R.M., Johnson, S., Kaufmann, C.R., Kidd, P., Leon-Chisen, N., Maclean, S., Manton, A., Mcclain, P.W., Michelson, E.A., Pickett, D., Rosen, R.A., Schwartz, R.J., Smith, M., Snyder, J.A. & Wright, J.L. (1998) Data Elements for Emergency Department Systems, Release 1.0 (DEEDS): A Summary Report. *Annals of Emergency Medicine,* 31(2): 264-73.

Randall, R.C., Vrijhoef, M.M.A. & Wilson, N.H.F. (2002) Current trends in restorative dentistry in the UK: a Delphi approach. *Journal of Dentistry,* 30(4): 177-87.

Razzak, J.A., Luby, S.P., Laflamme, L. & Chotani, H. (2004) Injuries among children in Karachi, Pakistan--what, where and how. *Public Health,* 118(2): 114-20.

Richards, J. & Ferrall, S. (1999) Inappropriate use of emergency medical services transport: comparison of provider and patient perspectives. *Academic Emergency Medicine,* 6(1): 14-20.

Rubin, H.J. & Rubin, I.S. (1995) *Qualitative interviewing,* California, Sage Publications.

Rucker, D.W., Edwards, R.A., Burstin, H.R., O'neil, A.C. & Brennan, T.A. (1997) Patient-Specific Predictors of Ambulance Use. *Annals of Emergency Medicine,* 29(4): 484-91.

Sermeus, W., Van Den Heede, K., Michiels, D., Delesie, L., Thonon, O., Boven, C.V., Codognotto, J. & Gillet, P. (2005) Revising the Belgian Nursing Minimum Dataset: From concept to implementation. *International Journal of Medical Informatics,* 74(11-12): 946-51.

Slaughter, A., Katz, R.V. & Grasso, J.E. (1999) Professional attitudes toward denture adhesives: A Delphi Technique survey of academic prosthodontists. *The Journal of Prosthetic Dentistry,* 82(1): 80-9.

Smyth, E.T.M. & Emmerson, A.M. (1996) Survey of infection in hospitals: use of an automated data entry system. *Journal of Hospital Infection.* 34(2), 87-97.

South African Triage Group (SATG), 2007. *South African Triage Score* [www.triagesa.co.za] [Accessed 18 March 2008]

Spaite, D., Benoit, R., Brown, D., Cales, R., Dawson, D., Glass, C., Kaufmann, C., Pollock, D., Ryan, S. & Yano, E. (1995) Uniform Prehospital Data Elements and Definitions: A Report From the Uniform Prehospital Emergency Medical Services Data Conference. *Annals of Emergency Medicine*, 25(4): 525-34.

Stathers, G., Delpech, V. & Raftos, J. (1992) Factors influencing the presentation and care of elderly people in the emergency department. *Medical journal of Australia,* 156(3): 197-200.

Statistics South Africa (StatsSA) 2007 *Stats Online* [http://www.statssa.gov.za/default.asp] [Accessed 28 November 2007]

Svenson, J.E. (2000) Patterns of use of emergency medical transport: A population-based study. *The American Journal of Emergency Medicine,* 18(3): 130-4.

Svenson, J.E., Spurlock, C.W. & Calhoun, R. (1997) The Kentucky Emergency Medical Services Information System: current progress and future goals. *The Journal Of The Kentucky Medical Association,* 95(12): 509-13.

Thompson, C.B. & Schaffer, J. (2002) Minimum data set development: air transport time-related terms. *International Journal of Medical Informatics,* 65(2): 121-33.

Thompson, I.M. (1999) Automated entry of nosocomial infection surveillance data: use of an optical scanning system. *Journal of Hospital Infection,* 43(Supplement 1): S275-8.

Thomson, N. (2005) Emergency medical services in Zimbabwe. *Resuscitation,* 65(1): 15-9.

Toth, D. (2003) A standardized language for occupational health nursing-the nursing minimum data set. *AAOHN Journal.* 51(7): 283-6.

Trauma and Emergency Medical Services Information System Project (TEMSIS), 2004. *New Hampshire PreHospital Dataset, Version 2. EMS Dataset* [http://www.nh.gov/safety/divisions/fstems/ems/research/documents/TEMSISImplementation.pdf] [Accessed 19 March 2008]

Ulin, P., Robinson, E. & Tolley, E. (2005) *Qualitative methods in public health: A field guide for applied research,* San Francisco, Jossey-Bass.

United Nations (UN), (2003) [http://www.un.org/english/] [Accessed 2 April 2003].

Vaughan, S., Schumm, J. & Sinagub, J. (1996) *Focus group interviews in education and psychology,* London, Sage Publications.

Verhagen, A.P., De Vet, H.C.W., De Bie, R.A., Kessels, A.G.H., Boers, M., Bouter, L.M. & Knipschild, P.G. (1998) The Delphi List: A Criteria List for Quality Assessment of Randomized Clinical Trials for Conducting Systematic Reviews Developed by Delphi Consensus. *Journal of Clinical Epidemiology,* 51(12): 1235-41.

Wallis, L., Gottschalk, S., Wood, D., Bruijns, S., De Vries, S. & Balfour, C. (2006) The Cape Triage Score - a triage system for South Africa. *South African Medical Journal,* 96(1): 53 - 6.

Weiss, S.J., Ernst, A.A., Phillips, J. & Hill, B. (2000) Gender differences in state-wide EMS transports. *The American Journal of Emergency Medicine,* 18(6): 666-70.

Wilson, H.S. (1989) Recognizing and evaluating study designs. IN Wilson, H.S. (Ed.) *Research in Nursing.* 2nd ed. Redwood City, Addison-Wesley.

World Health Organization (WHO), 2000. *World Health Report 2000.* Geneva. [http://www.who.int/en/] [Accessed 28 November 2007]

World Health Organization (WHO), 2007. *WHO Statistical Information System* [http://www.who.int/en/] [Accessed 28 November 2007]

Wofford, J.L., Moran, W.P., Heuser, M.D., Schwartz, E., Velez, R. & Mittelmark, M.B. (1995) Emergency medical transport of the elderly: A population-based study. *The American Journal of Emergency Medicine,* 13(3): 297-300.