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Original article

The variables perceived to be important during patient handover by South African prehospital care providers

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ABSTRACT

Introduction: High-acuity patients are typically transported directly to the emergency centre via ambulance by trained prehospital care providers. As such, the emergency centre becomes the first of many physical transition points for patients, where a change of care provider (or handover) takes place. The aim of this study was to describe the variables perceived to be important during patient handover by a cohort of South African prehospital care providers.

Methods: A purpose-designed questionnaire was used to gather data related to prehospital emergency care provider opinions on the importance of certain patient variables.

Results: We collected 175 completed questionnaires from 75 (43%) BAA, 49 (28%) ANA, 15 (9%) ECT, 16 (9%) ANT and 20 (11%) ECP respondents. Within the ten handover variables perceived to be most important for inclusion in emergency centre handover, five were related to vital signs. Blood pressure was ranked most important, followed by type of major injuries, anatomical location of major injuries, pulse rate, respiration rate and patient history. These were followed by Glasgow Coma Score, injuries sustained, patient priority, oxygen saturations and patient allergies.

Conclusion: This study has provided some interesting results related to which handover elements prehospital care providers consider as most important to include in handover. More research is required to correlate these findings with the opinions of emergency centre staff.

African relevance

- There is a paucity of literature related to handover within the African context.
- Adverse events as a result of poor handover have a significant cost implication that the resource-constrained healthcare system can ill-afford.
- Identification of the importance of handover variables for inclusion in emergency centre handover have the potential to improve handover.

Introduction

Within the South African context, high-acuity patients are typically transported directly to the emergency centre via ambulance by trained prehospital care providers. As such, the emergency centre becomes the first of many physical transition points for patients, where a change of care provider (or handover) takes place [1]. An appropriate handover, conveying all the essential clinical and associated information, is essential to ensure continuity of care for patients [2]. This continuity of care is achievable only through well-coordinated interactions between the different health professionals involved in a particular handover, whether roadside to hospital, or between teams in the hospital [3].

Handover is a complex process and a number of different definitions have been proposed, largely as consensus on a particular definition has not prevailed [4–7]. Not all of these adequately convey the message that handover is both a compound noun as well as a phrasal verb. We summarised what we believe to be the important aspects of the various definitions in a definition in Box 1.

Error in handover has the potential to adversely affect continuity of care [2]. Although few studies have linked handover to harm, it seems unlikely that handover is an innocuous process [8]. Known potential harm surrounding poor handover practice includes an increased incidence of clinical error, delayed treatment, longer patient stay and

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Box 1
Summary definition of handover compiled from various existing definitions for this study.

> Handover is a patient-centred process that presents adequate and contextually relevant patient-specific information from one medical professional to another. Handover information is presented in a structured format that facilitates optimal information transfer and recall, as well as establishing a shared understanding of the patient's condition, to ensure ongoing continuity of care. Handover serves to transfer responsibility and accountability for continuity of care from one medical professional to another. The handover process is complete once the receiving medical professional indicates (verbally or in writing) that they have taken over responsibility for the patient.

unnecessary use of clinical resources [9–13]. In essence, improvement in handover practice has the potential to improve safety [14]. What is not quite clear are the specific variables that contribute to safe handover and consequently safe continuation of clinical care.

The aim of this study was to describe the variables perceived to be important during patient handover by a cohort of South African prehospital care providers.

Methods

A purpose-designed questionnaire was used to determine what variables prehospital care providers perceived to be important for inclusion at handover. To determine the variables to include in the questionnaire, a literature search was performed using PubMed (MEDLINE) in conjunction with the uJoogle search engine (© Innovative Interfaces, Inc. Emeryville, CA). Terms that were searched included 'handover', 'hand over', 'handoff', 'hand-off' as well as variations of these that included the word 'patient'. The abstracts of accessible articles were read and where found to be broadly relevant to the study aim, the full article was downloaded. Downloaded articles were further scrutinised and classified according to relevance. It is notable that there were few articles that directly dealt with prehospital to emergency centre handover. Variables associated with prehospital to emergency centre handover were extracted and ranked for frequency of reference in the articles. The most commonly referred to variables were then included in the questionnaire (Annexure A). A pilot study was carried to address reliability and validity of the questionnaire. The pilot study sample was made up of a selection of prehospital care providers with different training backgrounds. Prehospital emergency care personnel register with the Health Professions Council of South Africa and scope directly relates to registration category. In terms of training the following applies with registration categories indicated in brackets. Basic ambulance assistants (BAA) complete a four to six-week course, ambulance emergency assistants (ANA) a sixteen week course and critical care assistants a nine-month course (ANT). Emergency care technician (ECT) completes a two-year diploma and national diplomates a three-year qualification (ANT). Emergency care practitioner completes either a national diploma followed by an additional year or alternatively a full-time four-year degree at an accredited higher education institution (ECP). The ECP, ANT and ECT categories are generically referred to as advanced life support, the ANA category as intermediate life support and the BAA as basic life support with corresponding skills and procedures within each registration category. The pilot study included two persons registered on the ECP register, two persons registered on the ANT register, three persons registered on the ANA register and three persons registered on the BAA register. Each was requested to complete the questionnaire and then report specific comments or suggestions to improve it. Completed pilot questionnaires were also analysed for trends in completion. However, all questionnaires were completed appropriately without any significant discrepancies noted and without any significant comments from the pilot study sample. The questionnaire was subsequently edited as directed by the pilot.

The categories of prehospital emergency care personnel surveyed and their relevant registration categories were basic ambulance assistant (BAA register), ambulance emergency assistant (ANA register), critical care assistant and national diplomate (ANT register), emergency care technician (ECT register) and emergency care practitioner (ECP register). At the time of data collection there were no accurate data available on the numbers of each registration category in the sampled population. This, combined with the disparity between the total numbers in each HPCSA registration category meant that a stratified sampling strategy would not be practical. A convenience sampling strategy was used to collect data and once 175 questionnaires had been collected, a determination was carried out related to how many respondents there had been from each registration category. The number of respondents per category was deemed to be sufficient given that there were no accurate comparative data.

Data collection was undertaken by approaching potential participants at their place of work to complete a paper-based questionnaire. This included informed consent. Completed questionnaires were anonymously collected. Responses were manually captured into Excel® (Microsoft Office, Microsoft Corporation, Redmond, WA) per HPCSA registration category for analysis. Demographics were described by cross-tabling participants' registration category with their field experience. We calculated the median and interquartile range for the various experience categories using existing functions in Excel®. Responses for the questionnaire were recorded and frequencies calculated for each response using existing functions in Excel®. Data for the handover variables were used to determine percentage responses for each handover variable's level of importance. The percentage responses were used to determine which handover variables had the highest percentage of 'Critically important' responses. Handover variables were ranked from most to least important using the percentage of responses that had indicated that the variable was critically important. 'No response' responses were excluded from the dataset and resultant calculations.

The study was approved by the University of Cape Town Faculty of Health Sciences Human Research Ethics Committee (HREC/REF: 624/2012).

Results

We collected 175 completed questionnaires from 75 (43%) BAA, 49 (28%) ANA, 15 (9%) ECT, 16 (9%) ANT and 20 (11%) ECP respondents. Questionnaires were distributed personally and on the request of some potential respondents, were left at the place of work in a box for completion at a time convenient to them. This meant that it was not possible to track the exact number of questionnaires distributed and completed to determine a response rate. All questionnaires collected were used in the data and there were no questionnaires excluded.

Table 1 describes the importance ranking of handover information variables for the prehospital emergency care provider population sampled. Levels of importance were determined using the percentage of respondents who assigned a critical level of importance to each information variable. No responses were excluded from the dataset.

Respondents' levels of experience in the prehospital emergency care environment are described in Table 2.

Discussion

Within the ten handover variables perceived to be most important,

Table 1
Importance of handover information variables ranked from most to least important.

Information variable	Critically important % (N =)	Important % (N =)	Somewhat important % (N =)	Unimportant % (N =)
Blood pressure	73% (127)	26% (45)	1% (2)	0% (0)
Type of major injuries	68% (114)	29% (49)	1% (2)	1% (2)
Anatomical location of major injuries	64% (103)	32% (51)	4% (7)	0% (0)
Pulse rate	64% (111)	33% (57)	2% (4)	1% (1)
Respiration rate	63% (109)	34% (60)	3% (5)	0% (0)
History	63% (34)	31% (17)	6% (3)	0% (0)
Glasgow Coma Score	59% (99)	36% (61)	5% (8)	0% (0)
Injuries sustained	58% (33)	40% (23)	0% (0)	2% (1)
Patient priority	55% (42)	41% (31)	4% (3)	0% (0)
SpO_2 (oxygen saturation)[a]	51% (87)	43% (73)	4% (7)	2% (3)
Allergies	51% (88)	44% (75)	3% (6)	2% (3)
Mechanism of injury/ nature of Illness	49% (50)	43% (44)	8% (8)	1% (1)
Hypotensive episode prehospital	48% (77)	44% (72)	5% (8)	3% (5)
ECG analysis[b]	43% (71)	45% (74)	8% (13)	4% (7)
Medications	42% (71)	51% (87)	5% (9)	1% (2)
Time since incident	41% (68)	48% (78)	9% (14)	2% (4)
Death of an occupant in the same compartment	40% (62)	42% (64)	12% (18)	6% (10)
Restrained/ unrestrained	36% (60)	50% (82)	10% (16)	4% (7)
End tidal CO_2[c]	36% (55)	44% (68)	14% (22)	6% (9)
Past medical history	36% (62)	56% (96)	6% (10)	1% (2)
Patient mobility	35% (58)	47% (77)	15% (25)	2% (4)
Capillary refill	32% (56)	47% (81)	19% (33)	2% (3)
Past surgical history	32% (52)	52% (85)	13% (22)	3% (5)
Approximate impact speed	31% (51)	49% (81)	18% (30)	2% (4)
Airbag deployment	29% (46)	52% (83)	16% (25)	4% (7)
Damage to car/ intrusion	29% (49)	43% (73)	20% (33)	8% (14)
Temperature	27% (46)	50% (86)	21% (36)	2% (3)
Demographics	25% (11)	43% (19)	23% (10)	9% (4)
TEWS Score[d]	21% (30)	47% (66)	16% (23)	15% (21)
Age	21% (35)	56% (94)	20% (34)	3% (5)
Last meal/drink consumption	19% (22)	50% (58)	26% (30)	4% (5)
Gender	14% (22)	47% (75)	30% (48)	9% (15)

[a] SpO_2 = blood oxygen saturations measured with a non-invasive pulse oximeter.
[b] ECG = electrocardiograph.
[c] CO_2 = carbon dioxide.
[d] TEWS = Triage Early Warning Score.

Table 2
Respondents' levels of experience.

HPCSA register	< 5 years % (N =)	5 to 10 years % (N =)	10 to 15 years % (N =)	> 15 years % (N =)	Median (IQR)[a]
BAA	38% (20)	46% (24)	12% (6)	4% (2)	6 (6)
ANA	9% (4)	25% (11)	39% (17)	27% (12)	13 (8)
ECT	21% (3)	36% (5)	29% (4)	14% (2)	10 (7.25)
ANT	6% (1)	31% (5)	25% (4)	38% (6)	14.5 (11.75)
ECP	22% (4)	33% (6)	28% (5)	17% (3)	6.5 (7)
Total	22% (32)	35% (51)	25% (36)	17% (25)	

[a] IQR = interquartile range.

five were related to vital signs. Blood pressure was ranked as the most important variable and pulse rate was fourth most important, respiration rate fifth, Glasgow Coma Score seventh most important and SpO_2 tenth most important. Other physiological variables also deemed important were hypotensive episode prehospital (thirteenth), ECG analysis (fourteenth) and $EtCO_2$ (nineteenth). Interestingly, temperature was ranked twenty-seventh most important. The dynamic nature of patient illness and presentation means that each variable also has a contextual value. This is demonstrated in the low ranking of temperature. In the hypo- or hyperthermic patient, temperature would become a critical variable to include in handover. The same argument could be made for variables related to trauma patients and medical patients where variables such as mechanism of injury or past medical history would have contextual relevance.

A number of variables related specifically to the trauma patient were also assigned a relative importance for handover. Type of major injuries and anatomical location of these injuries were ranked second and third respectively. Time since incident ranked relatively low at sixteenth but this may have been due to the contextual nature of the patient or may have been due to the acute setting in the emergency centre not being immediately concerned with timelines. In addition to these, information variables specific to the motor vehicle accident patient; death of an occupant in the same compartments and whether or not the patient was restrained ranked seventeenth and eighteenth respectively. Where relevant, these variables would carry a greater importance than in the generic patient presenting to the emergency centre.

Patient history is an important part of contextualising the patient within the construct of the current chief complaint. The patient history assists in the identification of co-morbidities and in light of this, there may be areas of the history that are patient-dependent. Generic patient history was ranked sixth and there were no other handover variables specifically related to the patient's medical history in the top ten. Allergies was ranked eleventh, patient medications fifteenth and past medical history twentieth. Other variables related to patient history included patient mobility (twenty-first), past surgical history (twenty-third) and patient demographics (twenty-eighth). The importance of patient history is often determined by the nature of the chief complaint. The fact that these variables rank so low may be a cause for concern. The data suggests that identification of pre-existing medical conditions may not enjoy the priority that perhaps it should.

Currently described mnemonics do not classify the importance of patient variables. The first items for handover in many mnemonics do not seem to enjoy congruency with the variables identified as important from this study. In fact the opposite appears to be true. Information related to patient demographics were classified low on this importance scale (both age and gender in the bottom three) whereas they form the first information in DeMIST mnemonic [15]. Similarly, mechanism of injury and situation information both of which are part of the initial information exchange in the MIST [16] and SBAR [17] mnemonics also scored low on the importance scale.

It is interesting to note that the Triage Early Warning Score (TEWS) score was the fourth lowest ranked variable. The TEWS Score has been adopted quite extensively in the Western Cape province [18]. This has seemingly not been the case within the Gauteng Province prehospital emergency care population where this study was conducted. This serves to further highlight the discrepancies in practice between provinces within South Africa. Perhaps it is time to start asking questions important to how practice standardisation has the potential to affect continuity of care.

There are a number of mnemonics that are used to facilitate better handover [19]. None of these categorise the importance of the information that they seek to include. In addition, it does not appear that any of these mnemonics were conceptualised with the aim of handing over important information first. The discrepancies in importance placed on variables by different prehospital emergency care providers and the incongruence with commonly used handover mnemonics highlights just how far from standard information transfer current handover practices are. Qualification and experience differences and varying patient acuities may be contributing factors.

Most prehospital emergency care provider (80%, n = 118) had less than ten years of workplace experience. The highest number of respondents (n = 63) had less than five years of workplace experience. The ECT, ANT and ECP respondents had the highest proportions of respondents with less than five years of experience. There are proportionately lower numbers of registered prehospital emergency care personnel in these categories [20]. This is compounded by the numbers of advanced life support prehospital emergency care providers who leave the country to find work elsewhere [21]. There is usually a minimum clinical experience timeframe required for expatriate work, meaning that many higher qualified practitioners with experience have left the South African healthcare sector.

Conclusion

This is potentially the first study where an attempt has been made to rank specific patient variables in order of importance for inclusion in emergency centre handover. This study has provided some interesting results related to which handover variables prehospital care providers consider as most important to include in handover.

The perceived importance of patient variables may be an indicator of which patient variables should be standardised for inclusion into handover. Further studies are required to determine the levels of importance assigned to specific patient variables by receiving staff in the emergency centre. Other areas requiring further research include the determination of the objective value of these variables on patient care, triage code and mortality and morbidity. This may objectively assist in the development of future handover protocols.

Author Contribution

Authors contributed as follow to the conception or design of the work; the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: AWM, 75%; COA, and SRB 10% each; and SG 5%. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Dissemination of results

Oral presentation at Emergency Care Society of South Africa Conference, Cape Town, 2016. Oral presentation at Emergency Care Society of South Africa Conference, Cape Town, 2016. Poster presentation at the ICEM conference in Cape Town, 2016. Oral presentation at the African Healthcare Conference at Gallagher Estate in 2018.

Conflict of interest

Prof Stevan Bruijns is an editor of the African Journal of Emergency Medicine. Prof Bruijns was not involved in the editorial workflow for this manuscript. The African Journal of Emergency Medicine applies a double blinded process for all manuscript peer reviews. The authors declared no further conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.afjem.2019.01.014.

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