

The Development of Consensus-Based Descriptors for Low-Acuity Emergency Medical Services Cases for the South African Setting

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Abbreviations:

ED: emergency department
EMD: Emergency Medical Dispatch
EMS: Emergency Medical Service
LMIC: low- and middle-income countries
RTA: road traffic accident

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Abstract

Introduction: Emergency Medical Services (EMS) are designed to respond to and manage patients experiencing life-threatening emergencies; however, not all emergency calls are necessarily emergent and of high acuity. Emergency responses to low-acuity patients affect not only EMS, but other areas of the health care system. However, definitions of low-acuity calls are vague and subjective; therefore, it was necessary to provide a clear description of the low-acuity patient in EMS.

Aim: The goal of this study was to develop descriptors for “low-acuity EMS patients” through expert consensus within the EMS environment.

Methods: A Modified Delphi survey was used to develop call-out categories and descriptors of low acuity through expert opinion of practitioners within EMS. Purposive, snowball sampling was used to recruit 60 participants, of which 29 completed all three rounds. An online survey tool was used and offered both binary and free-text options to participants. Consensus of 75% was accepted on the binary options while free text offered further proposals for consideration during the survey.

Results: On completion of round two, consensus was obtained on 45% (70/155) of the descriptors, and a further 30% (46/155) consensus was obtained in round three. Experts felt that respiratory distress, unconsciousness, chest pain, and severe hemorrhage cannot be considered low acuity. For other emergency response categories, specific descriptors were offered to denote a case as low acuity.

Conclusion: Descriptors of low acuity in EMS are provided in both medical and trauma cases. These descriptors may not only assist in the reduction of unnecessary response and transport of patients, but also assist in identifying the most appropriate response of EMS resources to call-outs. Further development and validation are required of these descriptors in order to improve accuracy and effectiveness within the EMS dispatch environment.

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Introduction

Emergency Medical Services (EMS) are designed to respond to and manage patients experiencing life-threatening emergencies; however, not all responses by EMS are for emergent or life-threatening conditions. Emergency Medical Services have the potential to respond more efficiently to the higher acuity patient, which is hindered by the availability of vehicles and resources transporting the low-acuity patient.¹ High volume response to non-emergency calls with lights and sirens not only increases the risk of motor vehicle accidents,² but also predisposes EMS staff to factors such as poor staff morale, poor job satisfaction, skills decay, and fatigue.^{2,3}

With regards to the emergency department (ED), there exists a substantial amount of research on the low-acuity (non-emergent) patient^{4,5} and the negative consequences these patients have on the higher acuity patients. Some of the research includes overcrowding and the time dedicated to the low-acuity patient in the ED. It has been shown that the arrival of one low-acuity patient to an ED significantly impacts the waiting times for treatment provided to a patient of high acuity.⁴ It is also noted that one-third of ED patients are low acuity and a major contributor to this proportion is ambulance arrivals.⁶ One study has shown that 41% of patients transported to hospital were deemed to be low acuity and 79% of these patients could have been safely treated in a primary care center.⁵

Much research has been published around prehospital discharge or treat-and-refer procedures internationally. There is also indication that telephonic assessment of emergency calls identified patients that were less likely to require treatment in the ED and therefore had the ability to reduce unwarranted response of emergency vehicles to some calls.⁷ A further study showed that telephonic advice for these calls had proven to be safe and recommended full implementation in a clinical trial setting.⁸

In the US alone, it is estimated that US\$560 million could be saved annually through the appropriate management of patients with lower acuity.⁶ Consideration may be provided for emergency care practitioners in local EMS systems to provide on-scene discharge of patients and that the exact operational procedures for this requires further consideration and research prior to implementation.⁹ Although prehospital discharge is a useful mechanism in reducing low-acuity patient transport to hospitals, it does not alleviate the impact of the initial ambulance response to these calls. Dispatching of EMS resources timeously and appropriately based on patient acuity would be the ideal dispatching system, balancing patient safety and adequate resource allocation and utilization.⁸

In South Africa, the problem of lack in emergency resources is well-established with only 2,000 of the required 5,700 ambulances being in operation,¹⁰ therefore compounding the highlighted predisposing factors with emergent response to low-acuity calls. It was evidenced that 39% of patients presenting to an ED were transported by ambulance,¹¹ and 47% of these patients did not require admission.¹¹ Another study showed that 58% of all patients attended to by EMS required no prehospital clinical intervention (only transport) and concluded that EMS systems are unable to meet the demand as a result of such responses.¹²

Accuracy in dispatching resources according to triage is a key issue to bridge the gap between patient medical needs and EMS resources dispatched.¹³ This extends to existing dispatching protocols to be efficient and accurate in categorizing and triaging patients. International research all indicate a problem with over-triage resulting in the unnecessary response and transport of the low-acuity patient to hospital.¹³⁻¹⁵ Over-triage internationally ranges from 23% to as much as 78%. Over-triage in South Africa has been reported to be as high as approximately 94%,¹² which is staggering in comparison to the rest of the world.

A popular system used in dispatching of EMS is the Medical Priority Dispatch System (MPDS). This dispatching system has reduced EMS response to calls of low acuity, however still has some problems in over-triage.^{16,17} Major aspects to be considered with this system are the cost, which is in excess of \$10M,¹⁸ and the lack of validation of this system in a low- and middle-income country's (LMIC's) EMS environment, like South Africa. With eleven official languages, the diverse language profile of South Africa is another contributor to the accuracy of dispatch. This is particularly pronounced during emergency call taking, as the telephonic words and descriptors of the caller really provide the only clues for Emergency Medical Dispatch (EMD) staff to recognize and accurately assign acuity of patients.¹⁹

Research in the appropriate use of EMS resources has tried to define greater efficiencies in protocols used for the dispatching of resources, however this has been difficult. Organizations and countries operate independently and protocols coupled with outcome criteria for each EMS service vary, therefore studies have been difficult to evaluate.⁵ However, a consistent fact is that if the dispatch protocol is more accurate, this will reduce the amount of unnecessary resources being dispatched to lower acuity calls. Problems

associated with low acuity are compounded by the fact that there is no clear evidence-based criteria to the concept of "low acuity in EMS,"²⁰ and those available are vague and vary subjectively between health care providers.²¹

The aim of this study is to develop consensus-based descriptors for low acuity in EMS within South Africa.

Methods

Design

A Modified Delphi study was conducted to obtain a set of consensus-based descriptors of low-acuity patients in EMS through experts in the field of prehospital and emergency medicine. These experts are well-experienced in EMS²² and from various geographical locations around the country.

Setting

Emergency Medical Services in South Africa service patients through public and private systems. The public system is funded by the Department of Health, while private EMS service patients through reimbursement models such as medical insurance. In South Africa, 82% of the population does not have medical insurance and therefore relies on the public health care system. From an EMS perspective, there should be approximately 5,700 ambulances (1/10,000 population)²³ in South Africa, but there are less than 2,000 ambulances in operation.¹⁰

Sample and Sampling

Participants recruited for this study were professional medical providers with tertiary qualifications within prehospital and emergency medicine. Participants were also required to be registered with the relevant professional regulating body in South Africa. Further, only participants with a minimum of two years operational experience within South Africa were eligible for participation.

The initial group of participants were nominated by the researcher via purposive sampling to ensure quality of the candidates.^{24,25} Participants were then provided the opportunity to nominate more candidates for the study through snowball sampling. A list of interested candidates with contact details was gathered and invited to participate in the study.²² These participants were evaluated by the researcher prior to invitation and were excluded if minimum recruitment criteria were not attained. The online survey tool Lime Survey (LimeSurvey GmbH; Hamburg, Germany) was used to conduct the study.

Procedure

This survey was conducted in three rounds. All participants were requested to provide informed consent for their participation.

The first round was developed through information gathered from literature available.^{16,17} Participants were asked for their agreement on three initial binary questions that should not be considered as low acuity (respiratory distress, unconsciousness, and severe hemorrhage). The balance of questions posed to the expert panel were open-ended questions under groups of potential emergency response categories as identified in the literature. Participants were asked to provide their expert opinion on criteria that could denote a patient as low acuity under each of the emergency response categories presented to them.

After the first round, open-ended questions within each emergency response category resulted in descriptors of low acuity being developed. Following content analysis, these descriptors were presented to the panel in round two through binary outcomes of "agree" or "disagree." Participants were also provided free-text

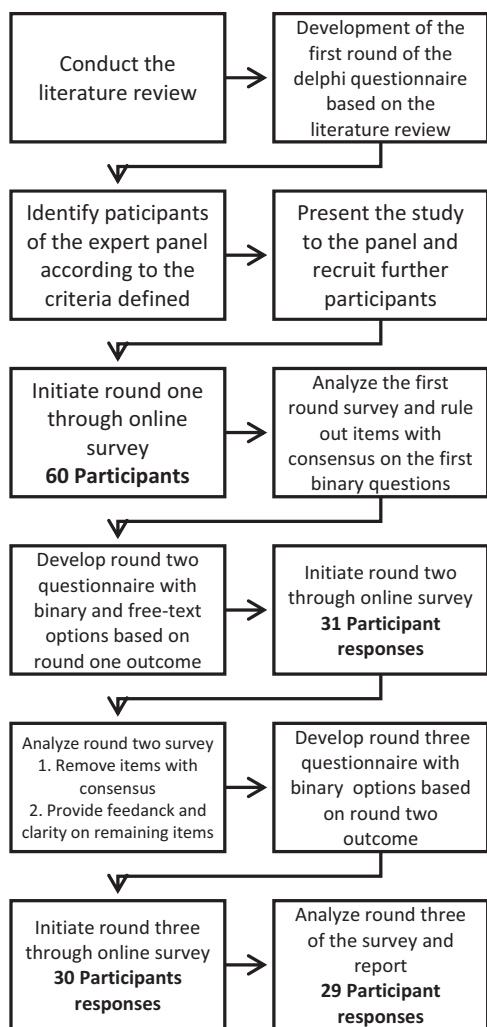


Figure 1. Process Flow of Delphi Study.

options to justify their responses. These comments were condensed and subjected to content analysis and presented to participants in round three which offered clarification and information for further consideration. Round three of the survey had binary outcomes only with no provision for free text in order to finalize consensus. Figure 1 depicts the process used.

Consensus for each descriptor was obtained when 75% of the participants either agreed or disagreed to the binary question. Consensus obtained on a particular descriptor would result in it either being excluded or included in the final list and was not presented to the participants in a subsequent round.

This study was approved by the Human Research Ethics Committee (HREC) of the University of Cape Town (Cape Town, South Africa; HREC Ref 491/2019). The results are presented in accordance with the proposed Conducting and Reporting DELphi Studies (CREDES) checklist.²⁶

Results

Invitations were sent to 60 candidates, 31 of whom completed round one of the survey providing a response rate of 52%. In round two, 30 responses were received with an attrition rate of three percent. A further attrition rate of three percent was noted with 29 respondents in round three, providing a total response rate of

Participants	n	%
Advanced Life Support Practitioners	26	90
Operations Management	15	52
Doctors	3	10
Experience	n	%
2 to 5 Years	1	3
6 to 10 Years	6	21
>11 years	22	76

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Table 1. Demographics of Participants

Round	n	%
Round 1		
Consensus on Questions	3/3	100
Round 2		
Consensus on Questions	67/152	44
Round 3		
Consensus on Questions	46/85	54
Non-Consensus on Questions	10/155	6
Exclusions	29/155	19

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Table 2. Summary of Consensus

94% for the study. Candidates that completed all three rounds of the survey (n = 29) were either Advanced Life Support practitioners in EMS (n = 26) or a medical doctor employed in the field of prehospital or emergency medicine (n = 3). Demographics of the participants that completed all three rounds in the Delphi are presented in Table 1.

Table 2 provides a summary of the levels of consensus achieved through each round of the survey. Consensus was achieved in round one on all three binary disqualifier questions posed to participants, which were then excluded in the following rounds. Round one also yielded (n = 152) descriptors for all emergency response categories provided, which were then posed to participants in round two for consensus and opinion.

Round two of the survey achieved 44% (n = 67) consensus on all binary questions, which were then excluded in round three. For the remaining questions in round two, the free text was analyzed, which resulted in questions being excluded (n = 29) and questions being clarified (n = 85) which were then asked again in round three. The final round achieved 54% (n = 46) consensus on all questions, which resulted in an overall 75% consensus received on all binary questions through all three rounds.

Table 3 presents the descriptors that reached consensus on conclusion of the Delphi survey and therefore provide criteria for low acuity within each emergency response category.

Discussion

The aim of this study was to develop descriptors for low-acuity emergency calls for the South African context. “Low acuity” is a

Fundamental Descriptors	n	%
No loss of consciousness	27/31	87
No form of respiratory distress	28/31	90
No signs of severe hemorrhage	31/31	100
Abdominal Pain	n	%
Abdominal pain in female patients of child-bearing age is considered low acuity if: 1. Last menstrual period is obtained 2. There is no history of undetected pregnancy	23/29	79
Abdominal pain is not related to trauma	25/29	86
No bleeding from any orifice	26/29	90
No associated fever with abdominal pain	26/29	90
Pre-existing condition with unchanged chronic pain	27/30	90
No signs of guarding to the abdomen	26/30	87
Patient is ambulant	23/30	77
Allergic Reactions	n	%
Limited to skin reactions and topical symptoms only	27/30	90
Only one body system is affected, excluding respiratory/cardiovascular systems	23/30	77
No medical history of anaphylaxis or severe reactions	24/29	83
Animal Bites	n	%
Minimal trauma or bleeding to the affected area	27/29	93
Animal bite is from a domestic pet that is up to date with its vaccination record	27/29	93
No requirement for any anti toxins	23/30	77
Patient is bitten by a known vaccinated animal	24/29	83
The animal has traceable medical records	28/29	97
Minimal injury to limb/extremity rather than face, neck, or head with no severe hemorrhage	28/29	97
Patient is an adult	24/29	83
Assault	n	%
No central nervous system compromise	26/30	87
Minimal force on the patient is established	23/30	77
Superficial injury sustained	28/30	93
No significant pain felt by the patient	23/30	77
No penetrating trauma to head, neck, chest, and abdomen	29/30	97
Minimal trauma to extremities with no bleeding, deformity, fractures, or CNS compromise	30/30	100
Back Pain	n	%
The patient is ambulant	24/30	80
Pain is bearable	24/30	80
No history of trauma experienced in the last 14 days	25/29	86
If related to trauma, pain must be bearable with no peripheral neurological compromise	23/30	77
Back pain is not associated with other body systems such as cardiovascular, respiratory systems, and urinary systems problems	25/30	83
There is no peripheral neurological compromise at all	28/30	93
Back pain is chronic in nature	24/30	80
No signs of infection noted	25/30	83
Back pain is related to minor muscle injury	28/30	93
Non-progressive back pain older than 24 hours	29/29	100
Burns	n	%
The burn is superficial only	28/30	93
The superficial burn must be less than 10% BSA and exclude the head, neck, and genitalia	22/29	76
Chemical burns should not be considered low acuity	24/30	80
Electrical burns should not be considered low acuity	26/30	87

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Table 3. Descriptor Consensus for Low Acuity Calls in South Africa

Chest Pain	n	%
Difficult to consider as low acuity	27/30	90
Cannot be dispatched as low acuity	24/30	80
Seizures	n	%
Known epileptic that already had a seizure and is now alert	24/29	83
Patient is ambulant after the seizure	25/29	86
Known history of pseudo-seizures (psychogenic non-epileptic seizure)	22/29	76
Diabetes	n	%
Patient is conscious and orientated	30/30	100
Patient is a controlled diabetic on medication	26/30	87
Patient is not hypoglycemic	28/30	93
Patient displays slow onset hyperglycemia with no reduction in GCS, polyuria, polydipsia, or polyphagia	27/29	93
Patient glucose levels are normal after receiving treatment	24/30	80
A patient that is hypoglycemic, conscious, and orientated can be offered telephonic advice and referral	24/29	83
All diabetic patients that have no life-threatening signs and symptoms can be offered telephonic advice and referral	24/29	83
Submersion Incidents	n	%
Patient is alert with no respiratory compromise	27/29	93
No suspected injuries such as head or neck trauma	28/29	97
Electrocution	n	%
Patient has a local wound with no systemic affects, no loss of consciousness, no respiratory depression	27/29	93
The patient has been electrocuted with low voltage and shows no adverse effects	24/30	80
The electrocution was of minor duration with no loss of consciousness and no adverse effects	25/30	83
There must be no associated mechanisms of injury with the electrocution such as a fall from a height	24/30	80
Falls	n	%
No obvious injuries from the fall	25/30	83
The patient must be fully ambulant	25/30	83
The patient must not have any peripheral neurological deficit	26/30	87
Hemorrhage	n	%
Minor bleeding that is easily controlled	26/30	87
Headaches	n	%
Headaches is of known origin such as stress	24/30	80
There are no associated signs of neurological deficit	27/30	90
A patient who has a history of headaches	23/30	77
Mild to moderate headache that is not related to trauma	25/29	86
No pyrexia with headache	25/29	86
Heart-Related Problems	n	%
No loss of consciousness, respiratory depression, no related symptoms such as chest pain or fatigue	25/29	86
Environmental Exposure	n	%
Must have limited exposure to the environment	29/30	97
Presents with mild hyper/hypothermia	24/30	80
Must be alert and orientated	28/30	93
No nausea and vomiting	24/30	80
No adverse related conditions	27/30	90
Minimal duration of exposure with no loss of consciousness	25/29	86
Patient can mobilize to a medical facility within 15 minutes	23/30	77
Patient is ambulant with no signs of confusion or dizziness	27/30	90

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Table 3. Descriptor Consensus for Low Acuity Calls in South Africa

Overdose	n	%
Patient has taken medication more than 24 hours ago and shows no signs of acute deterioration	24/29	83
Gynecology	n	%
Usual regular menses with normal/slightly abnormal discharge	28/30	93
Patients that have menstruation cramps are low acuity	26/30	87
Abnormally high discharge during menstruation: patient to be referred	25/29	86
Sexually transmitted diseases and associated symptoms with no immediate life-threatening signs and symptoms	28/29	97
No potential pregnancy with abdominal pain	24/30	80
Pelvic inflammatory diseases with no immediate life-threatening signs and symptoms	27/29	93
Obstetrics	n	%
Patient appointments or booked transports are low acuity	25/30	83
A patient that is experiencing transient contractions with a good antenatal history and is ambulant	26/29	90
Delivery of the baby is not imminent, and contractions are at least 8-10 minutes apart with a good antenatal history	26/29	90
Psychiatry	n	%
Patient is not violent or aggressive	27/30	90
Patient is not a danger to themselves or anyone around them	28/30	93
Patient will not require physical or chemical restraint	25/29	86
Patient has a mild mood and anxiety disorder	23/30	77
No suicidal intentions	26/30	87
Penetrating Trauma	n	%
Limb involvement with minor controlled bleeding and no loss of limb movement	29/29	100
No peripheral neurological compromise	23/30	77
Blunt Trauma	n	%
Minimal or no pain to the patient following blunt trauma	26/30	87
Blunt trauma to extremities with no signs of swelling or deformities can be referred	29/29	100
The injury must be superficial	28/29	97
Low mechanism (eg, punch rather than baseball bat)	25/30	83
A single blunt trauma injury rather than multiple blunt trauma	24/29	83
Road Traffic Accidents (RTAs)	n	%
The RTA must be of a very low mechanism of injury	27/30	90
Low speed RTA and patient has self-extricated	27/29	93
The patient must be ambulant	28/29	97
Patient must have been restrained in the vehicle	26/29	90

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Table 3. Descriptor Consensus for Low Acuity Calls in South Africa

Abbreviations: BSA, body surface area; CNS, central nervous system; GCS, Glasgow Coma Scale; RTA, road traffic accident.

term that categorizes patients subjectively and is vague in its definition²¹ making it difficult to apply operationally. Emergency calls in the EMD are also over-triaged as there are concerns that patients may die or staff may be subject to medicolegal litigation for incorrect dispatch.²⁷

Determining which patients require an emergency response is a challenge and often results in disagreements between EMD staff and EMS operational staff.²⁷ New and safe dispatching protocols in the EMD are required for the reduction in unnecessary responses and transport of patients.²⁷ Their development may be guided through the implementation of algorithms based on the criteria for low-acuity denotation identified in this study. However, the complexity of developing these algorithms is exemplified in these results as each emergency response category had (mostly) unique consensus-based criteria that should be applied.

The panel identified three universal criteria that disqualified cases from being deemed as low acuity. The panel felt that instances where loss of consciousness, respiratory distress, or severe hemorrhage are reported cannot be considered as low acuity. Respiratory distress is of particular interest as this was highlighted as one of the emergency response categories with a high risk for over-triage, but was also ranked as the third highest emergency category in the Western Cape, South Africa.²⁷ Respiratory pathologies are ranked in the top ten causes of death in South Africa^{28,29} and were also shown to have a reduced discharge rate from the ED in a similar study conducted in Gauteng, South Africa.⁹ Comments received from the expert panel indicated that respiratory complaints are difficult to denote as low acuity telephonically because such a decision would be entirely dependent on an unknown caller's ability to assess a patient in respiratory distress. The risk in dispatching an emergency case with

a patient in respiratory distress is evident in this study and therefore recommend that these cases be distinguished as high acuity with the development of an algorithm to enhance these dispatches.

The most prevalent cause of death in South Africa after HIV is cardiovascular disease, which has shown a remarkable increase from 2007 to 2017.²⁸ The expert panel in this study felt very strongly that patients exhibiting chest pain cannot be categorized as low acuity. Statistics of call-outs from the EMD in the Western Cape for chest pain are slightly above two percent of the total emergency calls received, however all staff indicated that these emergency response categories carried a high risk of over-triage.²⁷ The potential of over-triage for these chest pain patients are evident as common symptoms of a heart attack can be linked to other forms of pathologies, such as respiratory problems, heartburn, or even anxiety attacks.³⁰

In the case then of respiratory distress and chest pain, it is perhaps not which calls to denote as low acuity, but instead to accept a priority response from the outset and develop algorithms that may instead distinguish those patients with higher risk from the others.³¹ This may ensure that those prehospital providers with the requisite scope of practice and equipment to manage patients with asthma and myocardial infarction be dispatched preferentially. These algorithms will be heavily reliant on the caller's description of the patient.³⁰

The highest discharge rate for medical patients in Gauteng brought in by ambulance was among those with gastrointestinal complaints (36%).⁹ Gastrointestinal emergencies also constitute almost 11% of emergency responses in the Western Cape.²⁷ The high rates of call-outs, together with discharge rates, indicate that these patients may not have warranted transport to hospital but may have benefitted from other medical assistance such as referral to primary health care facilities or telephonic advice. Consideration must be provided for confounding factors in these cases such as the prevalence of gastrointestinal complaints found in patients with sepsis; a South African study found that 40% of patients with the prehospital diagnosis of sepsis were described as having gastrointestinal symptoms at initial emergency telephone call.¹⁹ The consequent descriptors from the expert panel may provide distinguishing criteria for low-acuity cases in reducing the high call-out rates and therefore contribute to the development of algorithms in reducing unnecessary dispatch of abdominal cases.

Obstetric emergencies in Africa have been the second highest call-out volume for EMS³² and make up six percent of call-outs in the Western Cape.²⁷ Although delays in these responses contribute to maternal mortality through obstetric complications,³³ implementation of any dispatch protocol in this respect requires meticulous consideration in order to mitigate maternal deaths, which are known to be as high as 84% in LMICs.³⁴

Road traffic accidents (RTAs; 47%) and patient assaults (37%) accounted for 83% of trauma-related discharges brought in by

ambulance.⁹ These statistics are significant, especially if there exist mechanisms to redirect these patients from the ED, providing efficiency to the health care system. Not dispatching emergency vehicles to RTAs received via telephone may be a challenge as injuries at the time of the call may not be known; however, the descriptors may provide value in supporting other systems like on-scene discharge to limit the unnecessary transportation of patients to the ED. Many of the patients in these cases with minor medical requirements, like alleviation of pain or tetanus toxoid injections, may be transported or preferably referred to primary care clinics after evaluation by emergency medical staff.³⁴

The development of algorithms using these descriptors in each call-out category may not only terminate responses to calls of low acuity, but may also provide distinguishing criteria between high-acuity and low-acuity dispatch models and contribute to alternative dispatch systems that can influence policy of response to calls. This may be in the form of a time critical response approach to some calls where lights and sirens are required, or other cases where an acceptable time frame for response may be determined through evidence-based decisions. The implementation of algorithms in dispatching emergency resources to calls will also support other EMS systems such as on-scene discharge or telephonic advice systems. The challenge of receiving emergency calls in the EMD in a multilingual country with varying levels of literacy and education may also be alleviated through protocol-driven algorithms which can be informed through the low-acuity descriptors of this study.

Limitations

The results and recommendations of this study are based on expert opinion, which represents a low level of evidence-based medicine. For this reason, further development of these criteria is recommended as well as future research to refine and test these results.

Participants for this study were all South African registered emergency care practitioners and medical doctors to ensure that descriptors were contextual to the setting. This might limit the external validity of the study and results should be applied to other settings with caution.

Conclusion

The results of this study have provided a set of descriptors in order to define low acuity within the EMS environment of South Africa. A significant level of responsibility lies with the EMD center in reducing the dispatch of resources to low-acuity calls. These descriptors may be developed into algorithms that will affect an appropriate response to emergency calls. Further research is required in validating the application of these definitions in the EMS environment.

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