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Original article

Development of a checklist for auditing completion of patient report forms: A Delphi study

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ABSTRACT

Introduction: Medical records are an integral part of patient care. Information loss during the handover from Emergency Care Providers to hospital staff is common and has a significant impact on patient care. Information loss can be prevented with medical documentation that is accurate, complete and contains the relevant information regarding patient management. Patient report Forms (PRF's) are used by Emergency Care Providers to record the details of their patient care and they form part of the patients' medical records. Quality assuring of PRF's is required to determine if the required information has been recorded on the PRF. Checklists are one the means of quality assuring PRF, by comparing the points on the checklist to the content of the PRF.

Methods: An three-round Delphi survey was conducted with experts to determine the relevant information (data elements) required for the completion of a PRF including any additional South African – specific elements.

Results: Thirty-two experts participated in the Delphi survey, which identified 166 data elements for the check list and this was refined to a final 133 elements after collation by the researchers. A proposed checklist was developed.

Discussion: The Delphi process is a useful technique to develop a checklist. A checklist consisting of 133 total possible data elements to quality assure PRFs was designed. Further research regarding the use and reliability of the checklist is required.

Introduction

Medical documentation is an integral aspect of patient care. Amongst several objectives, one of its key functions is to facilitate the continuity of care [1]. This is especially true during and after patient handover which is often considered a high-risk period for information loss [2]. Prehospital documentation should include all patient related information and treatment provided to the patient by Emergency Care Providers [3]. Information about prehospital events, clinical findings and treatment can help expedite appropriate medical care during and after patient handover. Particularly in critical patients, the initial in-hospital management ideally forms a continuum of the prehospital phase and thus relies on accurate information provided by Emergency Care Providers, first by a verbal and then written handover [2]. The lack of such information at the time of handover can result in inappropriate and/or untimely medical care and ultimately increased lengths of stay in the emergency unit [2]. The adequacy of Emergency Medical Services (EMS) documentation can be used as a quality measure of appropriate prehospital care. Since there is a twofold increase in mortality risk in patients with incomplete medical records compared to patients for whom the EMS documentation was complete, such measures may be an important quality assurance tool [4].

The quality of the information recorded on the PRF is therefore important for patient care and is also vital for audit, clinical governance, education and medico-legal aspects of patient care [5]. The aim of this study was to develop a checklist to audit the quality of recording of vital patient information and the documentation of patient care provided, by South African Emergency Care Providers in the pre-hospital environment, with the intention of assisting with clinical audits, clinical governance and the education of Emergency Care Providers. Established or developing EMS systems across the African continent could make use of the findings from this Delphi survey as a mechanism for auditing medical documentation and ensuring compliance, together with training.

There has been an increase in medical negligence claims in South Africa, with the public being more aware of the potential liability of EMS [1]. Poor quality medical records make it difficult to defend a clin-

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ical negligence claim, or a Health Professions Council of South Africa (HPCSA) disciplinary enquiry and it is axiomatic that poor note keeping is evidence of poor clinical practice [6] The phrase "if it is not recorded, it wasn't done" is intended to remind practitioners that the medical notes they record need to be of adequate quality to defend themselves in a legal battle, by being able to prove adequate patient management, since the patient records are the only lasting proof of what occurred during patient management. It is therefore important that patient report forms are accurate, complete and should contain relevant information about the patient and patient management [1]. The handover process used by Emergency Care Providers has been found to vary and vital information has been found to be missing on PRFs [7,8]. There are numerous scoping elements and patient related information required for the adequate completion of a PRF. The HPCSA provides a list of information that is required for medical documentation, but some items may not apply to the prehospital setting (e.g., test and scan results) [9].

Methods

Due to limited research having been conducted on the topic, especially in South Africa a scoping review with the aim of determining "What are the essential variables required for the completion of a PRF", was conducted during December 2019 to February 2020. The three-step search strategy used a Boolean phrase which was searched on four search engines, namely in Pubmed, CINAHL, Summon and Scopus. The results were recorded on a data collection form and screened for relevance. The data elements that are required for the completion of a PRF were extracted from the articles that were reviewed in full. These data elements were used to derive a list of variables required for patient handover and needing to be recorded on a patient report form. The list of results from the scoping review were used to populate the information for the first round of a three-round Delphi survey which was used to establish a detailed list of data elements important for the completion of a PRF by South African Emergency Care Providers.

The Delphi study was conducted between 15 June and 1 December 2020. Ethics approval was obtained through the Durban University of Technology Institutional Research Committee (172/19). Informed consent was obtained via on-line methods. The Delphi survey is used as a structured process to develop and identify consensus by experts on a topic or problem [10]. This process is aimed at guiding group opinion towards a final decision, which could not have been made by one person alone [19,11,12]

The Participants for a Delphi survey are not randomly chosen for participation but are selected for a purpose due to their knowledge on the problem being investigated. Authors need to consider the size and composition of the Delphi group, which is governed by the purpose of the group. In an attempt to maximise the validity and acceptability of the study, the inclusion of "experts" is required. This remains one of the critiques of Delphi survey as the term "expert" is poorly defined or validated and may range from persons who have an interest in the topic to a person who has achieved "high status" with in their profession [12]. Considering the subjectiveness and the poor definition of the "experts" required for Delphi surveys the authors considered several factors in deciding which medical professionals to include as participants in the Delphi survey. Although the group size required for participants in a Delphi survey varies the authors were faced with the task of creating selection criteria to recruit participants to create a group of multidisciplinary participants with comprehensive and or authoritative knowledge on the prehospital field and interest in the topic, to ensure participant motivation, through several rounds of questionaries, in an attempt to generate a consensus [12]. This is done while accepting that not all invited participants would participate in the survey but needing to limit the number of participants to avoid diluting the consensus or prolonging the survey process [12].

Due to their scope of practice participants included in the study were Emergency Care Providers registered as a "paramedic" on the Ambulans Noodsorg Tegnikus (translated from Afrikaans: Ambulance Emergency Technician) (ANT) register (one of the registration categories under the Pre-Hospital Emergency Care section of the HPCSA) with the HPCSA. These practitioners have completed a Critical Care Assistant Course or National Diploma in Emergency Care. Emergency Care Practitioners (practitioners who have completed a BTECH or BHcS Degree in Emergency Medical Care) and registered on the "Emergency Care Practitioner" register of the HPCSA, doctors registered on the medical register with the HPCSA and nursing sisters (with a nursing degree) registered with South African Nursing Council. Due the poor definition of a Delphi expert, the authors in an attempt to recruit participants with comprehensive and or authoritative knowledge on the prehospital field set a requirement that participants should have at least five years clinical experience. Due to their limited scope of practice, and to avoid difficulties in data analysis due to a high number of participants, Basic & Intermediate life support Emergency Care Providers and Emergency Care Technicians were excluded from the survey. No patient or members of the public were involved in the study as the objective was to obtain the opinion of health care practitioners with "expert" knowledge in the prehospital field. The participants in the survey had work experience from across South Africa and abroad, both in the private and public health sectors, which included management, education and quality assurance roles, although this wasn't a specific participant requirement.

Potential Delphi survey participants were identified from the existing known practitioner lists obtainable from the HPCSA and other experts on the Medical Board, as listed in the inclusion criteria. This was used to create a provisional database of industry experts to approach to potentially participate in the study. In addition to this, messages were sent through the researcher's social and professional networks, requesting potential interested participants to contact the researcher. Based on the responses a database of potential participants who met the inclusion criteria was developed.

The potential participants were then approached in writing (via email), requesting them to participate in the research. An information letter was provided to the potential participants detailing information about the research. Participants who wished to participate in the research could click on the embedded link in the email, which was sent to them, to be able to read the letter of information, agree to participate in the research, and participate in the first round of the Delphi survey.

A common trend with Delphi surveys is for the initial study questionnaire to be used to collect information from participants, using open ended questions, before asking them to conduct any rating [13]. In round one of the Delphi survey, using Google forms participants were invited to suggest additional variables that they thought were applicable to the South African context, that had not already been discovered in the scoping review. The additional variables provided by the participants were consolidated with the data elements found in the scoping review, to form the quantitative questions for round two of the Delphi survey.

The content for the first round of this Delphi survey were derived from the results of a previously conducted the scoping review. This provided an initial list of data elements (n=94) that participants could then add additional data elements that they thought were required to be recorded in handover documentation

In the second and third rounds of the Delphi survey participants would, rate how important they thought each data element was using a Likert score on a scale of 1-5.

1= Strongly Disagree (This element should definitely be excluded from the checklist)
2= Disagree (I think that this element should be excluded from the checklist)
3= Neutral (I can't decide if this element should be included or excluded the checklist)
4= Agree (I think this element should be included on the checklist)

5= Strongly agree (This element should definitely be included on the checklist)

At the end of round two, analysis of data elements was undertaken, and a level of agreement was determined. For this research, the Likert scores were analysed ordinally. As the difference between the answers on the Likert score may be seen subjectively by participants as being the same they may not see the minor difference in the scores as significant [14]. The strongly disagree and the disagree were grouped together (labelled disagree) and the agree and strongly agree were grouped together (labelled agree). If eighty percent of the participants chose the same option (agree, neutral, disagree) for a particular variable then that element would be seen as having a high level of agreement.

Where there was a high level of agreement among participants that an element should be included in the checklist, the element was placed on a list for inclusion on the checklist as participants had already reached a high level of agreement regarding that variable. If there was a high level of agreement that the element should not be on the checklist, that variable was not put on the list or placed in the third round of the Delphi. For data elements where there was not a high level of agreement reached regarding inclusion or exclusion the element was included in the third Delphi round.

In the third round of the Delphi study, no new data elements were added. Data Elements where the required level of agreement had not been reached in the second round of the Delphi survey were used in the third round of the survey. Participants evaluated the remaining data elements using the same Likert score. For this round participants were provided individualised feedback on how they have rated a data element in the previous round versus how the group had rated the data element and were requested to review their score or leave it unchanged.

Results

The research population target group was South African Emergency Care Providers, nurses and doctors, who met the inclusion criteria. A total of 32 individuals met the required inclusion criteria, consented to participate in the study and competed the first round of the Delphi survey.

Most participants were practitioners registered with the Health Professions Council of South Africa. These included Advanced Life Support “paramedics” (n=10), registered on the ANT register. The majority of participants were Emergency Care Practitioners, (n=18) registered on the ECP register. Three doctors and one nurse (who has a nursing degree) also participated. An overview of the Delphi process is shown in Figure 1.

In round one participants provided qualitative input, confirming data elements and suggesting additional elements that they thought should be included on the checklist. There were eleven sections where participants could suggest additional data elements. Participants suggested or confirmed a total of 160 data elements. Some suggested variables from participants were duplicated, these were merged when recording the responses.

The variables from round one were collated and assimilated into the questionnaire for round two, where183 data elements that were rated by participants (n=28). In round two 150 data elements achieved a high level (80%) of agreement. The thirty-three data elements where there was no level of agreement met, were reassessed in the third round of the survey.

In round three, participants were able to see how the group had rated each of the remaining data elements in the previous round and could change their rating of the variables. Round three resulted in an additional 16 data elements (or 48%) achieving high level agreement. At the end of the Delphi survey participants had agreed on 166 data elements that they thought should be included in the design of the proposed checklist. After the third round of the Delphi survey the survey was closed.

After completion of the Delphi study (it was only planned to have three rounds, decreasing participant participation and concessions on data elements being met), it was noted that several of the data elements provided by the participants during the Delphi survey were very similar or duplicated. To resolve this issue the researchers independently reviewed all the data elements and after discussion agreed on the data elements that could be combined. All 133 data elements for inclusion in the checklist design, with a brief explanation of the data element are listed in Table 1.

Discussion

It has been shown by Spicer and Sobuwa [8] that vital information is often omitted from PRFs. However, there has been limited research on the topic of PRFs and the handover information that is required. Bowen [15] investigated the information required for the design of an PRF. Research on the patient care variables, which are perceived to be important during handover by South African paramedics, was conducted by Makkink et al. [16]. This research provided a list of patient-related criteria that are important for paramedics to mention during the handover of a patient. Internationally, van Vleet [17] investigated the information required during patient handover to avoid communication errors. These studies focused on PRF design and the data elements important for handover.

In the medical field checklists are important tools having been shown to decrease morbidity and mortality, improve the quality of medical care by ensuring a consistent standard of care, the improvement of patient and provider safety and adherence to evidence based best practice in many clinical areas [18].

The different tasks that a checklist guide a user through, has led to the development of several kinds of checklist. The criteria of merit checklists (COMlist) are commonly used for evaluative purposes as they include a rating and ranking of attributes (data elements) to evaluate. The criteria are given weights of importance and users give scores using a standard scale to evaluate each criterion. The sum of scores is used to measure merit [18,19]. Due to the intended role of COMlist checklists, this type of document was chosen for the proposed checklist.

Research focusing on the use of a checklist to ensure a quality patient report form was conducted in Australia by Smith, Boyle and MacPherson [20], who developed a checklist or a ‘quality assessment tool’, as they termed it, to ensure the quality of PRFs once they had been completed. The specific variables from a PRF that needed to be included in the checklist were researched by conducting a literature review, and a quality assessment tool was developed. It was found that patient details, observations and patient management were the three areas on a PRF that could be improved, so that the PRF would be more useful in documenting the continuum of healthcare of the patient. When the checklist was implemented, it resulted in over 90% of assessed PRFs passing the quality assessment at the two ambulance services where it was implemented in Australia. Despite this improvement, the committee that developed the checklist recommended that the tool should be evaluated on an ongoing basis. This checklist had fewer points to assess (n=33), since the data elements were grouped for assessment, instead of assessing individual elements. For example, instead of assessing individual vital signs, it assesses if vital signs are recorded. In addition, the data elements were not equally weighted and each element for assessment has a key which details the scoring for each data element that is being assessed.

These articles show the need for, and the benefit of, using checklists to ensure quality PRFs; and the need for further and ongoing research on the topic This study aimed to develop a checklist to enable EMS personal including, but not limited to, supervisors, managers, quality assurance staff and educators to audit the completion of vital patient information and the documentation of patient care provided, by South African Emergency Care Providers in the pre-hospital environment. This could be used amongst others for quality assurance monitoring of medical practice, monitoring performance on specific indicators and as a

Table 1
Complete list of variables included in the development of the checklist, with explanation.

Patient Demographics	Explanation
Patient's name and surname	Patient's first name (given name) and surname (family name) as per their ID document
Patient's age	Patient's age in years; if less than a year, in months; if less than a month, in days
Patient's sex	The sex of the patient, male or female
ID number	Patient's RSA identity number or passport number (international)
Patient's residential Address	The residential address where the patient lives
Patient's telephone number	The patient's telephone number – either cell phone or land line where they can be contacted
Family's telephone number	The family's or next-of-kin's telephone number, either cell phone or land line, where they can be contacted
Medical aid details (medical aid and number)	The name of the medical aid (medical insurance) that the patient is a member of and the policy number of the medical aid
Case/ambulance/crew details	
District or region	The municipal district or geographical area in which the ambulance is operating
Date	The day, month, and year on which the case was undertaken
Case number	A code which uniquely identifies the case, normally issued by the call centre
Names of pre-hospital providers	The ambulance crew members: first names (given names)/initial and surnames (family names) as per their ID documents
HPCSA numbers of pre-hospital providers	The full HPCSA registration numbers of the ambulance crews
Ambulance call sign or registration number	The combination of unique identifying letters, letters and numbers, or words, assigned to an ambulance / the number plate of the ambulance
Type of dispatch/case type – primary call or IFT	The type of case the ambulance is being sent on and the urgency of the case
Time the call was received at the communication centre	The time that the details of the case to which the ambulance was dispatched were received by the call centre
Time ambulance was dispatched	The time the ambulance crew was given the details of the case and dispatched to the location of the patient
Time ambulance arrived on scene	Time the ambulance arrived at the scene where the patient is located
Time of first patient contact	The time the ambulance crew made first contact with the patient
Time leaving scene	The time the ambulance left the scene
Time patient arrived at hospital	The time that the ambulance arrived at hospital
Type of transportation	The type of transportation that was used to transport the patient to hospital: ambulance, patient transport vehicle, helicopter, etc.
Location of patient/scene address	The address or place where the patient was located by the ambulance crew
Receiving hospital	The hospital that the patient was transported to for continued medical care
Mileage mobile to scene	Odometer mileage of the ambulance immediately before beginning the trip to the patient
Mileage at scene	Odometer mileage of the ambulance when arriving at the scene where the patient is
If call cancelled - reason for cancellation	If the case was cancelled once crew on scene to which dispatched. For example: no patient could be found, hoax call
Call completion reasons, other than patient transported to hospital (no patient found patient / refuses treatment etc)	The reason the case is completed (other than the patient was transported to hospital). This could be for several reasons (excluding patient was transported to hospital):no patient found/patient refuses treatment etc
Reason for delay: rerouted, came across an accident, breakdown, etc	If there was a delay in responding to the scene the reason for this delay must be recorded
Patient background /history	
Symptoms/chief complaints	A statement describing the symptoms (complaints which indicate disease); problems noticed by the patient
Allergies	Damaging immune response of the body by a substance, to which the patient has become hypersensitive.
Past and present patient history (medical/ surgical history/disability/co-morbidity/ severity of pre-existing conditions/family history)	An account of all medical events and problems a person has experienced that are important to consider in the management of the patient
Medication patient is taking	A list of any medication that the patient has been taking
Patient's last meal/drink	The last time that the patient had something to drink or eat
Events prior to calling ambulance.	The events that occurred before calling for medical assistance
Conditions where patient was found/social living circumstances	The environment in which the patient was found
Patient priority/ condition	
Documentation of pain	A description of the patient's pain, including the pain score and type of pain
Mechanism of injury/nature of Illness	The method by which damage (trauma) occurred / principal physical characteristic(s) of the injury or illness.
Documentation of injuries	Establishes the existence of an injury as well as its type and severity, giving an accurate written description of injuries
Patient mobility/patient movement.	The extent to which the patient has independent, purposeful physical movement of the body, or of one or more extremities
Blood loss. And quantity	Does the patient have any blood loss and if so, how much?
MOI from MVA	
Death of an occupant in the same vehicle	Was there another person in the vehicle who sustained fatal injuries?
Was patient restrained/unrestrained	Was the patient restrained with a seatbelt, or not?
Airbag deployment?	If the vehicle has an airbag, did the airbag deploy during the crash?
Damage to car/intrusion	What is the extent of the damage to the vehicle, which may be related to mechanism of injury?
Extrication time (if applicable)	If the patient was trapped, for how long was the patient trapped?
Was patient ejected or did patient self-extricate	If the patient is found outside of the vehicle, was the patient ejected from the vehicle or did they manage to exit the vehicle by themselves?
Other vehicles involved	Were there any other vehicles involved in the crash?
Position of patient in vehicle during impact	The position the patient was occupying in the vehicle at the time of the crash
Vital Signs	
Blood pressure	The patients systolic and diastolic blood pressure
Pulse rate	The patient's heart rate, recorded in beats per minute

(*continued on next page*)

Table 1 (*continued*)

Patient Demographics	Explanation
Pulse characteristics	The rhythm and force of the pulse
Respiration rate	The patient's respiratory rate measured in breaths per minute
Respiratory effort	Assessments of the patient respiratory effort (how easy or difficult it is to breathe)
Respiratory rhythm	The patient's breathing pattern
Lung sounds/air entry	An assessment, using a stethoscope, of the sound of the air moving through the lower airways and upper airways.
Glasgow Coma Score (including break down of score)	The Glasgow Coma Score of the patient, including the scores for each component of the Glasgow Coma Score: voice, movement, eye response
Spo2	The oxygen saturation level of the patient, measured using a pulse oximeter
Capillary refill	The time it takes for the capillary bead to turn pink, after it has been squeezed
HGT	The patient's blood sugar level, measured in mmol
Pupil reaction and size	The way each pupil of the eye reacts when light is shone into it; and the diameter to which the pupil contracts once the light is shone at the eye
MAP	The mean arterial pressure of the patient
Skin (turgor pitting oedema subcutaneous emphysema)	Any abnormal characteristics of the patient's skin
Regular recording of vital signs, based on patient's condition	A periodic repeat of the patient's vital signs, based on the patient's condition and or agency policy
Oxygen therapy administered	If the patient was administered supplemental oxygen therapy, which type of oxygen mask was used and what was the oxygen flow rate
Fluid therapy administered	If the patient had any fluids administered, what fluid was administered and how was it administered
Diagnostic procedures performed	A list of any diagnostic procedures that were performed on the patient
Breathing procedures	Any treatment administered to the patient, which is specific to the respiratory system
Circulation procedures	Any treatment administered to the patient, which is specific to the cardiovascular system
Details of medications administered	A description of any medication that was administered to the patient and should include: name of medication, time it was administered, route of administration and the dose of the medication
Fluid input and output	The amount of fluid that was administered to the patient and the fluid output of the patient
Level of sensation	The lowest area on the patient's body with normal sensory and motor functions
Physical examination findings/ secondary survey	Any abnormal findings or injuries found when examining the patient
Exposure and environmental control procedures done	Detail of how the patient was covered and or warmed if needed
Devices or manoeuvres used	Describe any manoeuvres that were used to treat the patient or list any devices used to treat the patient
Immobilisation (if applicable)	If the patient was immobilised, describe how the patient was immobilised and the equipment used
ECG analysis (if applicable)	If the patient's ECG was checked, record analysis of the ECG pattern
End tidal CO2 (if applicable)	If the patient's end tidal carbon dioxide levels were assessed what was the level of carbon dioxide
New-born's-APGAR, weight, temperature of incubator,	If the patient is a new-born, what was the new-born's APGAR, weight and the temperature setting on the incubator
Pre-hospital arterial blood gas analysis	Analysis of the blood gas, if available
Thrombolytic checklist (if applicable)	If applicable (if the patient had signs of ACS and the patient was being treated by an ALS practitioner), was a thrombolytic checklist completed?
Any treatment already administered by anther practitioner (if applicable)	If the patient was being treated by another practitioner, what treatment had been performed by this practitioner, prior to the patient handover?
Assessment of pelvis stability (if applicable)	If the patient's pelvis was assessed for a possible pelvic fracture, what were the findings of the assessment of the pelvis?
Neuroprotective interventions (if applicable)	If the patient has a possible head injury, the strategies that were employed to limit secondary tissue loss and/or improve functional outcomes
Results of POCUS/efast (if applicable)	The results of an ultrasound scan of the patient's abdomen, heart and lungs
If patient was paced what the pacing rate and voltage	If the patient was paced, what rate and voltage was the pacer set at
Patient handover	
Name and signature of person handing patient over	The name and signature of the person who was responsible for patient care
Name and signature of person receiving patient	The name and signature of the patient who is taking responsibility of further management of the patient
Time of handover	The time the patient was handed over to another medically qualified person, to continue medical care for the patient
Qualification and position of person handing over and qualification of receiving practitioner, including HPCSA number/nursing council registration/practice number	The qualification and the professional body registration number of the person receiving the patient
Clarifications raised during handover or any concerns	Details of any problems or additional explanations that were required during the hand over
Patient signed for refusal of services on the PRF (if applicable)	If the patient refused medical care, did the patient sign the PRF, refusing medical care?
If the patient refused services, is there a witness signature	If the patient refused medical care, did a witness also sign that the patient was refusing medical care?
List of personal belongings (cell phones, wallets, watch etc) and meds brought with patient and handed over (if applicable)	If any of the patient's belongings were transported with the patient to hospital, have these items been listed on the PRF (cell phones, wallets, watch etc)
List of equipment left behind to be collected later (if applicable)	If any medical equipment was left at the hospital. as it was required for continued medical care at the time, is there a list of this equipment recorded on the PRF?
Airway management	
Assessment of the airway	A description of how the airway was assessed to determine any abnormalities with regard to the airway
Indication for intubation	The conditions which were present, which required that the patient be intubated: apnoea, airway protection etc
RSI/intubation check sheet (from preparation to confirmation) (if applicable)	Confirmation of the steps listed on standard intubation checklists
Devices used in airway management (if applicable)	The devices that were used in management of the patient's airway

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Table 1 (*continued*)

Patient Demographics	Explanation
Details of airway management and airway procedures performed (including if RSI facilitated)	Details of the procedures that were used during management of the patient's airway
ETT depth secured/ ETT placement at teeth before and after transport.	The depth of the endotracheal tube at the patient's teeth
Number of intubation attempts	The number of intubation attempts that were required to intubate the patient
Intubation successful/not successful	Was the intubation process successful or not?
Patient's response to airway management	The patient's response to airway management procedures and treatment
Suction requirements	Details if the patient needed to be suctioned as part of the airway management process
If applicable: CPR	
Witnessed/unwitnessed arrest	Did someone see the person go into cardiac arrest or was the patient found, already in cardiac arrest
Estimation of how long patient was unresponsive before CPR was started	An estimation of how long the patient was in cardiac arrest before resuscitation efforts were commenced
Was bystander CPR being provided before EMS arrival on scene (duration of bystander CPR)	Did a bystander perform CPR, prior to EMS arrival on scene?
One-rescuer CPR or two-rescuer CPR	Was CPR performed by one person or two people?
Manual or device (autopulse/Lucas) compressions	Was a mechanical device (autopulse/Lucas) used to perform chest compressions?
Was an AED or defibrillation monitor used	What type of defibrillator was used during CPR?
Duration of CPR	How long was CPR performed on the patient?
ECG rhythms present and change of rhythms documented	Description of the ECG rhythms present during the resuscitation
Suspected cause of arrest (h's and t's)	The suspected cause of cardiac arrest (h's and t's)
Number of shocks delivered	If the patient was defibrillated, how many times was the patient defibrillated
Times for all evaluations and treatments during CPR	A record of times of evaluations and treatment steps that were initiated during the resuscitation
Post ROSC management? (if applicable)	Details of management if there was a return of spontaneous circulation
Medication administered (times, dose, route) during CPR	Details of medication administered during the resuscitation and the time the medications were administered
Patient's response to CPR	How did the patient respond to resuscitation efforts?
Fio2 used during CPR	The percentage of oxygen administered when ventilating the patient, during the resuscitation
Living will (if applicable)	Were there any 'do not resuscitate' orders for the patient and how were they effected?
ETCO2 reading during CPR	The levels of end tidal carbon dioxide measured during the resuscitation
If applicable: ventilator settings	
Peak airway pressure (or plateau depending on mode)	The highest level of pressure applied to the lungs during inhalation.
Respiratory rate	The ventilation rate the ventilator was set to
Mode of ventilation	The method of inspiratory support provided by the ventilator to the patient
PEEP	Peck end expiratory pressure
Tidal volume	The set volume of air moved into or out of the lungs during ventilation
Minute volume	The set volume of air that the ventilator ventilates in 1 minute
Plateau pressures (if using volume ventilation mode)	The pressure that alveoli and small airways of the lung are exposed to during mechanical ventilation
Insp time and exp time	The ventilator setting the determines much of that total cycle time is inspiration and how much is expiration
Morphology of ETCO2 waveform	The shape of the ETCO2 waveform
Trigger flow	The setting to the sensor to detect the change in the flow velocity of the basic airflow in the airway when the patient inhales spontaneously
Alarm settings	The alarm settings that were set on the ventilator

Abbreviation foot noteessions Council of South Africa, IFT interfaculty transfer, MOI Mechanism of Injury, MVA- Motor Vehicle Accident, SPO2- peripheral capillary oxygen saturation, HGT- Heamo Glucose Test, MAP- Mean Arterial Pressure, ECG Electro Cardio gram, CO2- Carbon Dioxide, APGAR- Activity Pulse Grimace Appearance Respiratory, POCUS- Point of Care Ultra Sound, eFAST- extended fast exam, PRF Patient Report Form, ROSC- return of spontaneous circulation, CPR Cardio Pulmonary Resuscitation, ETCO2 End Tidal Carbon Dioxide, PEEP Peak Expiratory End Pressure

teaching tool. The intention of the checklist is not for use while the Emergency Care Provider is completing the PRF but by the personal mentioned above.

The checklist is intended to be broad and cover many different aspects that Emergency Care Providers may need to document. The checklist is divided in to eleven separate assessment sections, based on the topics being assessed. Each element being assessed is allocated one point if the criterion being assessed is present. If the point that the criterion is assessing is not present on the PRF, or is inadequately recorded, a score of zero for that criterion should be recorded. The scores from each section of the checklist are totalled, and at the end of the checklist all the scores from the different sections are totalled. A new checklist must be used for every PRF that is audited. The user will use the checklist to assess the criteria under each section, allocating one or zero, based on the assessment of the data elements. The score for each section will be totalled at the end of each section. Once the checklist has been completed the scores from each section will be totalled.

Criteria and sections, which are marked with 'if applicable' are only to be assessed if they are applicable to the patient. These criteria do not apply to all patients, as they focus on the specific management of certain patients. For example, not all patients require endotracheal intubation, but if they are intubated there is a section for assessment specifically relevant to documentation of airway management. If these sections are assessed, the total score for that section will increase proportionally, and the total score for the checklist will increase. Thus, not all data elements and sections will be used for all patients.

The checklist can be used to assess how adequately information has been recorded on a PRF. To determine the figure which indicates that a PRF has been adequately completed, and thus passes the quality assessment, is a subject for further research.

The checklist was developed by utilising data elements from a scoping review and a three-round Delphi survey to establish 133 data elements, grouped into ten categories: Patient demographics, Case/ Ambulance / Crew details, Patient background /history, Injuries/illness/MOI and MOI from Motor Vehicle Crash, Vital Signs, Patient hand over, Airway management, Cardiopulmonary Resuscitation, Ventilator settings. This has provided the framework for the development of a checklist for auditing the quality of completion of PRFs by Emergency Care Providers in South Africa. The categories of this check list are similar to the categories in the quality assessment tool, which was developed in Australia

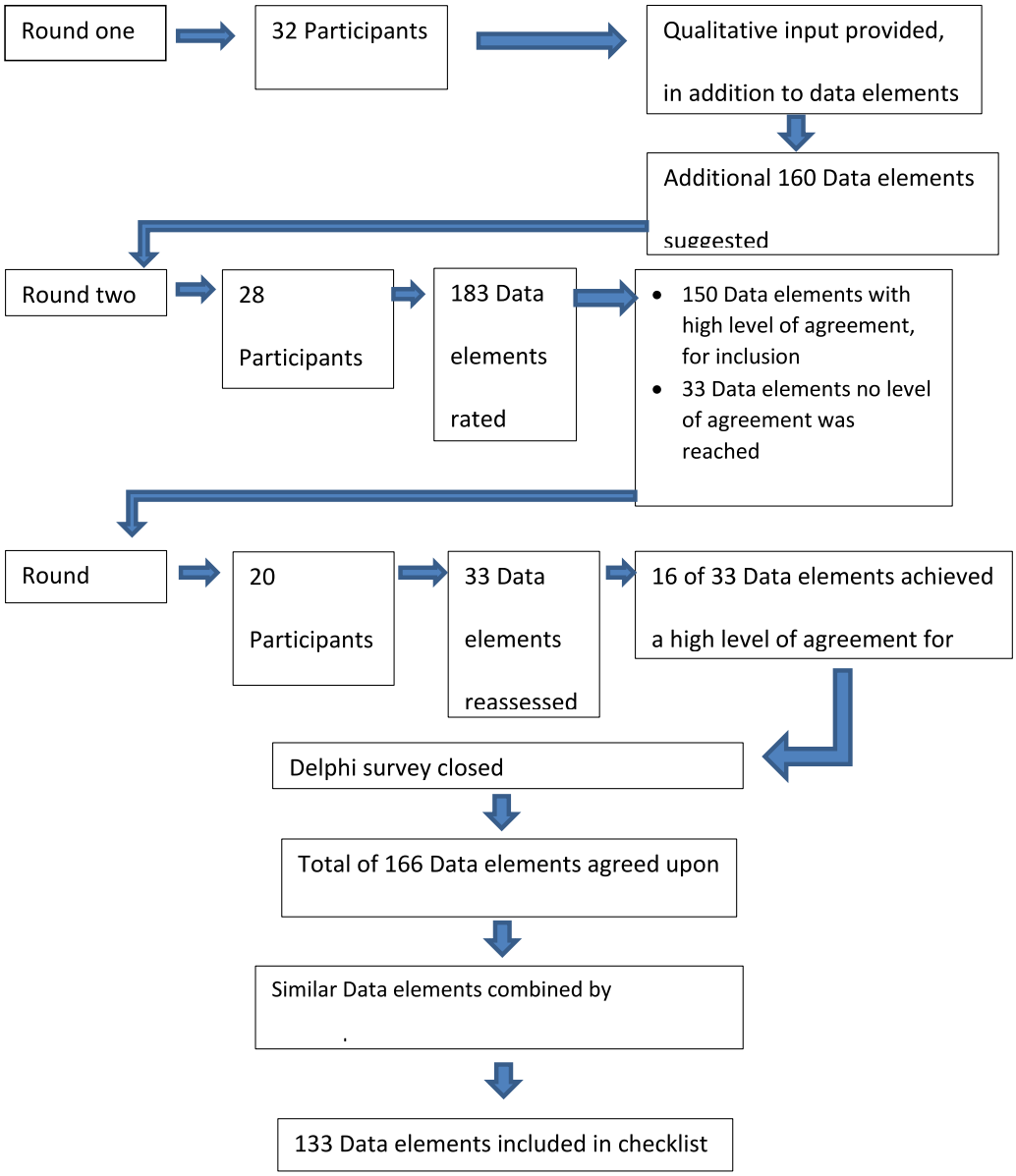

Fig. 1. Delphi Process.

by Smith, Boyle and MacPherson, to ensure the quality of PRFs once they had been complete. It was found that patient details, observations and patient management were the three areas on a PRF that could be improved, so that the PRF would be more useful in documenting the continuum of healthcare of the patient [20]. The gull designed checklist is available in the supplementary materials.

The strengths of the process were that although the prior scoping review identified data elements for inclusion in the checklist, the Delphi survey improved the validity and generalisability of the checklist. The response of participants to the Delphi survey was good resulting in a consensus. Most participants had exposure to multiple EMS systems in different South African provinces.

The authors are not aware of any similar publicly available or published checked lists. This checklist will require further research regarding:

- Weighting of the scoring of the different data elements and sections of the checklist.
- Ranking of importance of the different data elements and sections
- Validation and reliability testing by focus groups
- Operational implementation and assessment

We acknowledge several limitations of this study, which include: While there has been an increase in the use of Delphi surveys, there is still uncertainty in determining when an exact level of consensus has been reached in a Delphi survey [10]. The number of rounds needed to run a Delphi survey and what constitutes an 'expert' to participate in the survey are issues which are not well defined and subject to change, based on the research being conducted [13].

Not all of the participants completed the entire Delphi process. Most of the respondents in the Delphi survey were pre-hospital practitioners, and the opinions of hospital-based receiving providers may not have been adequately captured. The majority of the participants at the time of the study were based in a single province and there for the consensus reached in this study may not mirror consensus reached in another province/ setting should the method be repeated.

The nature of checklists, especially a COMlist type checklist focuses more on quantitative elements rather than qualitative data elements.

This means that the checklist is designed to check the presence of data rather than the quality or accuracy of the data. This means that it is also difficult to assess important issues like spelling and the legibility of the authors hand writing. There has also been no validation of the checklist and it has not been tested by a focus group or implemented operationally. However, the findings of this study and the PRF checklist are not final and warrant further research, to address these limitations so that the checklist can result in meaningful changes in practice.

Information loss can occur during patient hand over and has several potential significant patient and practitioner implications from affecting patient care, to limiting the ability of a practitioner to defend allegations of mismanagement. Medical documentation is of vital importance and is seen as part of patient care [21]. With the intention of improving the medical documentation recorded on PRFs by Emergency Care Providers, this research has led to the development of a checklist to assess the quality of information recorded on PRFs. Further research and development of the checklists is required.

Dissemination of results

This study was a part of an MHSc (EMC) dissertation for the primary author and was presented at the KZN Department of Health Research Day.

Authors' 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: RM contributed 50%; TH and RP contributed 25% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

Professor Hardcastle is an Associate Editor with AfJEM. The authors have no other conflict of interest to declare.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.afjem.2022.04.002.

References

[1] Van Huyssteen N. A Legal Analysis of the Emergency Medical Services in South Africa [MAGISTER LEGUM (LLM) PUBLIC LAW]. University of Pretoria; 2016.

[2] Carter A, Davis K, Evans L, Cone D. Information Loss in Emergency Medical Services Handover of Trauma Patients. Prehosp Emerg Care 2009;13(3):280–5.

[3] Goldberg S, Porat A, Strother C, Lim N, Wijeratne H, Sanchez G, et al. Quantitative Analysis of the Content of EMS Handoff of Critically Ill and Injured Patients to the Emergency Department. Prehosp Emerg Care 2016;21(1):14–17.

[4] Laudermilch D, Schiff M, Nathens A, Rosengart M. Lack of Emergency Medical Services Documentation Is Associated with Poor Patient Outcomes: A Validation of Audit Filters for Prehospital Trauma Care. J Am Coll Surg 2010;210(2):220–7.

[5] Bloomer R, Burns BJ, Ware S. Improving documentation in prehospital rapid sequence intubation: investigating the use of a dedicated airway registry form. Emerg Med J 2013;30(4):324–6.

[6] Medical Records in South Africa An MPS Guide [Internet]. Medical Protection Society; 2014 [cited 19 September 2020]. Available from: https://www.medicalprotection.org/docs/default-source/pdfs/booklet-pdfs/sa-booklets/medical-records-in-south-africa—an-mps-guide.pdf?sfvrsn=cda14eac_4

[7] Bost N, Crilly J, Patterson E, Chaboyer W. Clinical handover of patients arriving by ambulance to a hospital emergency department: A qualitative study. International Emergency Nursing 2012;20(3):133–41.

[8] Spicer R, Sobuwa S. An analysis of the validity of medical legal documentation in cases where the patient refuses treatment and/or transport. South African Journal of Bioethics and Law 2014;7(2).

[9] Health Professions Council of South Africa. 2016 b. Guidelines on the keeping of patient records. Available: https://www.hpcsa.co.za/Uploads/Professional_Practice/Conduct%20%26%20Ethics/Booklet%209%20Keeping%20of%20Patient%20Records%20September%20%202016.pdf (Accessed 3 June 2021).

[10] Holey EA, Feeley JL, Dixon J, Whittaker VJ. An exploration of the use of simple statistics to measure consensus and stability in Delphi studies. BMC Med Res Methodol 2007;7:52.

[11] Hasson F, Keeney S, McKenna H. Research guidelines for the Delphi survey technique. J Adv Nurs 2000;32(4):1008–15.

[12] Cantrill JA, Sibbald B, Buetow S. The Delphi and nominal group techniques in health services research. International Journal of Pharmacy Practice 1996;4(2):67–74.

[13] McMillan SS, King M, Tully MP. How to use the nominal group and Delphi techniques. Int J Clin Pharm 2016;38(3):655–62.

[14] Bhandari, P. 2020. Designing and analyzing Likert scales. Available: https://www.scribbr.com/methodology/likert-scale/#:~:text=A%20Likert%20scale%20is%20a%20rating%20scale%20used,you%20to%20easily%20operationalize%20personality%20traits%20or%20perceptions. (Accessed 20 June 2021)

[15] Bowen, J. M. 2008. Development of a tool to define the population of emergency medical care users in South Africa. Available: https://openscholar.dut.ac.za/bitstream/10321/335/1/Bowen_2008.pdf (Accessed 30 June 2019)

[16] Makkink AW, Stein COA, Bruijns SR, Gottschalk S. The variables perceived to be important during patient handover by South African prehospital care providers. Afr J Emerg Med 2019;9(2):87–90.

[17] Van Vleet CH. Emergency medical services to emergency department patient handover: A Delphi study of interprofessional content expectations. degree Doctor of Health Administration. Medical University of South Carolina - College of Health Professions; 2015. Available: http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=ccm&AN=109828492&site=ehost-live&scope=site&custid=s5210036 (Accessed 29 July 2020).

[18] Martz W. Validating an evaluation checklist using a mixed method design. Eval Program Plann 2010;33(3):215–22.

[19] Scriven, M. 2005. The logic and methodology of checklists. Available: https://www.semanticscholar.org/paper/THE-LOGIC-AND-METHODOLOGY-OF-CHECKLISTS-Scriven/263b77fec3e3bb7d3298399b4672b5ebf1c2c1ab (Accessed 28 July 2021).

[20] Smith E, Boyle M, MacPherson J. The Development of a Quality Assessment Tool for Ambulance Patient Care Records, London, England: SAGE Publications; 2004. Available: http://dut.summon.serialssolutions.com/2.0.0/link/0/eLvHCXMwjV07T8MwED4VWEBIvKG85AWJJa1jO68JlUdBCAmQioApshOHhTao0KH8M_4dd3UCiDKwZLAi2f78-ezzvQCkaHHvl0wItQ0SYaWKwzjJ4zALM8MjoaJcFbaYREvf36n7q-TxUpw34KUOjakAfW2RlxUOcCK7abPT43S7sjm2kZZSBjFq5lxSBikuj0Zv_dQ9f9dVNqiF7NWjPpm6M3KQHHt1uNsMzIkwiXBbzHWObx96tTCXQTSppUg9eNRFHXfzZ68_TrHKLayhVHVUdZfgo57VU9mi2lh0xUNm0RPE0LoTrBy2c-e48q6_MkKSbxyylgTbH3BgMwKCX4LE6eGVIXZ6gAey-w3MgTx10CDHvsHB1ml4lmGBQi-Ys1esQMMOVmHRPSwyFy-1BtdIbPbD1YmVBdPMpQIZs85XolHWK8tnhldy1umb0TORm924JLKMgq6YU7xf1-Gue9Y7ufCqqhCej9eRCKnkCy25NTxBChk_yFSgVRiHKjCo_VlVCKtx0rnCTZIohSQjJa4QuaDqg7HcgNlBObBbwFSU5JpqAJsoVLzQJkB9zsSaFzLghmdN2HTrmb641B8pamN4oZS8CYe0BGm9IKlfpU2fxnz7_7_uwHydR5L7uzD7NhzZPZhBRuxXvPwESEf3Gg (Accessed 30 June 2020).

[21] Hales B, Terblanche M, Fowler R, Sibbald W. Development of medical checklists for improved quality of patient care. Int J Qual Health Care 2008;20(1).