Preliminary Report

Utilize the Modified Delphi Technique to Develop Trauma Care Indicators

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Objective: *Develop performance indicators reflecting the quality of trauma-patient-care in the emergency room and hospitalization within the first 48 hours.*
Material and Method: *A two-round Delphi technique was conducted. A panel of 11 expert surgeons experienced in the fields of trauma care was consulted. The panel was initially asked to rate performance indicators that reflected the quality of trauma care given in the emergency department setting and hospitalization in the first 48 hours using a 5-point on visual analogue scale. The statement of indicators that was collected from the first round was analyzed and necessary changes were before resending to the same experts. Each indicator statement was considered consensus if the expert's opinion rating was 4 or 5 for more than 70% (8 out of 11 experts).*
Results: *Fifty-three performance indicators were proposed in four domains of trauma care in emergency room and four domains of trauma care in hospitalization within 48 hours. Altogether 35 indicators reached consensus reflecting quality of trauma performance after two rounds. Twenty-one of these were trauma care indicators in emergency room and 14 were trauma care indicators in hospitalization within 48 hours.*
Conclusion: *Twenty-one indicators of quality of trauma care in the emergency room and 14 in the hospitalization within 48 hours have been developed. They will be used as the tool by specialist for quality evaluation in the next phase.*

Keywords: *Trauma care, Performance indicator, Delphi technique*

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Trauma audit has been one of the cornerstones in the improvement in the quality of care delivered to injured patients[1].The goal of trauma audit is to reduce mortality and morbidity. Thus, the assessment of process of care is very important in quality improvement, which will be a part of trauma audit. Assessment of medical care quality is based on a review of process of care as has appeared in the medical records. There are many methods to assess quality such as explicit and implicit review[2]. In explicit review, the actual process of care is compared against a set of standards or criteria. Another common method uses indicators. These indicators were commonly designed based on the clinical guidelines. Thus, the major trauma patient process of care is fundamentally based on the Golden Hour protocol[3]. This protocol is used for major trauma patient according to The Utstein style, and defined as having an ISS (injury severity score) of 15 or more[4].

In the trauma center, tri-modal distribution of peaks of trauma death is as follows. The first peak of death occurs at time of injury and is due to injury to major organs. The second peak occurs at 1-48 hours and has many causes of morbidity and mortality that are preventable by avoidance of secondary injuries due to hypoxia, hemorrhage or other processes. Most trauma care is directed at this second peak by skillful

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assessment and treatment to reduce mortality and disability. The third peak of occurs at 1-3 weeks and results primarily from organ failure and infection[5].

The authors chose to study the process of care in the second peak of trauma death. Assessment of quality of process of care requires the development of indicators. In Thailand, there have not been any set of 48 hours indicators used to assess trauma care quality. The objective of the present study was to develop the indicators for the process of care on the major trauma patients; particularly, the 48 hours mortality indicators.

Material and Method

The authors identified criteria for the formation of the expert panel members based on clinical and expertise in trauma care. The inclusion criteria of experts were as follows, general surgeons with special interest in trauma care and more than 5 years of clinical experience in managing trauma patients. The present study recruited 11 experts.

Indicator development began with preparation of an initial list of potential indicators. Sources of indicator included current textbooks and medical literature concerning process of care on the major trauma patients. Furthermore, these indicators were developed from the literature on risk assessment and preventable death. The proposed indicators were chosen by the authors, and then the list of indicators formed the questionnaire for the first round. The questionnaire contained 53 questions in two separate sections, process of care in the emergency room, and during hospitalization within 48 hours. Each statement was rated 1-5 on a visual analogue scale (VAS) where 1 represented least agreement and 5 represented most agreement. Consensus was defined as agreement of 70% or more between experts on all indicators. Each indicator item was considered agreed if the expert's opinion rating was 4 or 5 for more than 70% (8 out of 11 experts).

Upon receipt of the first round response, the justification from experts was analyzed and indicators that were accepted by fewer than 30% of experts (3 experts) were omitted. The remaining indicators were re-distributed to the experts for a second round with an average mean, median/a mode with quartile deviation score of each indicator. The result will be used as the tool for specialist comment for quality evaluation in the next phase.

Results

There were 31 trauma care indicators in the emergency room and 22 indicators in 48-hour hospitalization listed in the first round. Complete two-round questionnaires were received from all 11 experts.

The 21 indicators in the emergency room reached consensus after two rounds, the expert panel suggested four indicators in the emergency room to be edited and put in the questionnaire in the second round. There were three emergency indicators excluded from the first round because they did not reach consensus. The important emergency room indicator that was excluded was "cricothyroidotomy in emergency room" indicator. Table 1 shows the 21 emergency room indicators and the number of experts accepting each indicator.

The 14 indicators during the 48-hour hospitalization reached consensus after two rounds. Two indicators were excluded and two were suggested to be edited and put in the questionnaire in the second round. Table 2 shows the 14 during 48-hour hospitalization and the numbers of experts accepting each indicator.

After two rounds, both emergency and during hospitalization indicators were a group. Thus, the number of indicators after the second round (35 items) was fewer than that after the first round (53 items).

Discussion

The Delphi technique is a method involving two or more rounds of a questionnaire. It was useful for researchers to clarify problems, develop questionnaire statement for rating, select panelist to rate them, conduct a questionnaire and feed back between rounds[6]. Many studies had used this method to establish appropriate criteria for treatment and diagnosis[7,8]. The authors used the Delphi technique to develop trauma quality indicators. The method was chosen for several reasons including the fact that these experts worked in different geographic regions and settings. Furthermore, the Delphi technique was iteration of rating of expert opinion which experts could add or drop indicators. Another advantage of the Delphi technique was the absence of face-to-face encounters by the panelists.

The present study was a two-round Delphi technique. The process was expired after the second round because indicators reached consensus. There was no indicator added or dropped from the questionnaire meaning that the consensus was reached.

The present study had some limitations. First, the statement included in the questionnaires did not cover all trauma care indicators, but were selected based on the relevance of death within 48 hours after reaching

Table 1. Emergency Room Indicators reached consensus after two rounds

Indicators	No. experts agreement
Domain A: Airway management and management of respiratory distress	
1. Assessment of airway compromise	10
2. Assessment of respiratory distress and adequacy of ventilation	11
3. Administration of oxygen	8
4. Chest tube insertion/Needle thoracocentesis	11
Domain B: Resuscitation of shock in emergency room	
5. Compression for control hemorrhage	10
6. Assessment of shock: Systolic blood pressure, Pulse rate	10
7. Peripheral percutaneous intravenous access /peripheral cut down access	10
8. Monitoring of resuscitation parameters: NG tube, Foley's catheter	10
9. Immobilization of fracture for hemorrhage control	11
10. Prevention of hypothermia: Warm IV/blood, Keep warm by blanket	8
Domain C: Investigation of head, chest, abdomen and pelvis	
11. Recognize altered consciousness: lateralizing signs, pupils, monitoring of raised ICP	11
12. CT scan: brain, if indicated	9
13. Immobilization of C-spine, if indicated	11
14. Film C-spine, if indicated	10
15. Chest X Ray	10
16. Recognize of respiratory therapy for chest injury/rib fracture	11
17. Recognize of presence or risk of abdominal injury	10
18. Diagnosis test etc Diagnostic peritoneal lavage, Ultrasonography, CT scan abdomen	9
19. Film pelvis, if indicated	9
Domain D: In hospital transfer	
20. Administration to appropriate unit	11
21. Appropriate of operation care management	11

Table 2. During hospitalization 48 hours indicators reached consensus after two rounds

Indicators	No. experts agreement
Domain A: Respiratory care	
1. Adequacy of ventilation	9
2. Administration of oxygen	9
3. Diagnosis and Monitoring of respiratory distress syndrome	10
Domain B: Resuscitation	
4. Assessment of shock: Systolic blood pressure, Pulse rate	11
5. Monitoring and treatment of shock	11
6. Differential diagnosis of cause of shock	10
7. Recognition of hypothermia	10
Domain C: Management of medical care	
8. Recognition of presence or risk of head, chest, abdomen injuries	10
9. Surgical treatment of head injury	10
10. Surgical treatment of chest injury	10
11. Surgical treatment of abdomen injury	11
12. Surgical treatment of pelvis injury	9
Domain D: Multidisciplinary team care	
13. Multidisciplinary team care	10
14. Specialist consultation	8

hospital. Most experts are usually concerned with the entire process of care during hospitalization, not only the first 48 hours. This might somehow affect the result of the present study. However, the evidence suggested that the quality of care influenced the death in the first 48 hours and the complications influenced the death in the later period[5,9,10].

Second, the sources of potential indicators were varied. There were websites, textbooks, risk assessments, trauma audits, and preventable death audits. Nevertheless, very few indicators reflected quality of care and death within 48 hours. Most of them were specific indicators for assessing quality of head, chest or abdomen trauma care. Using this approach, the author came up with a large number of indicators recruited into the first round.

Third, consensus determining was controversial. Some studies used mean score; others used percentage of rating[11,12]. In some studies, researchers decided that consensus was obtained when there was 100% agreement among experts, where in other studies consensus was considered when the majority of experts agreed on items[13]. The authors determined consensus as the expert's opinion rating was 4 or 5 for more than 70% (8 out of 11 experts).

In general, consensus among groups has been quantified using group mean or standard deviation[14,15]. The authors used mean for each item and displayed to the experts in the second round. The standard deviation was not used because the panel size was small (11 experts) which might mislead the conclusion.

In the first round, one important indicator was dropped. It was "cricothyroidotomy in emergency room". The panel suggested that the process was important but might not be used in some trauma centers because of limitation of structure, equipment or personnel.

Conclusion

In the present study, the authors used two-round Delphi technique to develop trauma care indicators that reflected 48 hours death. The questionnaires consisted of two sections: emergency room and 48-hour hospitalization, and were sent to 11 experts. The expert's opinion rating 4 or 5 for more than 70% (8 of 11 experts) was the determining consensus criteria. A set of 35 indicators have been developed. There are 21 indicators of the emergency room and 14 for the 48-hour hospitalization. These indicators will be used as the tool for specialist comment for quality evaluation in the next phase.

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การใช้วิธีเดลฟายเพื่อพัฒนาตัวชี้วัดสมรรถภาพที่สะท้อนคุณภาพการดูแลผู้ป่วยอุบัติเหตุ

ประภาพร สุวรัตน์ชัย, พรชัย สิทธิศรัณย์กุล, จิรุตม์ ศรีรัตนบัลล์, ธีรพล เจนวิทยา, วิมลวรรณ พลบุรี

วัตถุประสงค์: *เพื่อพัฒนาตัวชี้วัดสมรรถภาพที่สะท้อนถึงคุณภาพการดูแลผู้ป่วยอุบัติเหตุที่ห้องฉุกเฉินและเมื่อรับไว้รักษาในโรงพยาบาล 48 ชั่วโมง*

วัสดุและวิธีการ: *Delphi technique 2 รอบ ให้คณะผู้เชี่ยวชาญจำนวน 11 ท่านแสดงความคิดเห็นต่อตัวชี้วัดสมรรถภาพการดูแลที่ห้องฉุกเฉินและเมื่อรับไว้รักษาในโรงพยาบาล โดยใช้เครื่องมือวัดแบบ visual analogue scale 5 ระดับ นำข้อมูลรอบที่ 1 มาวิเคราะห์และปรับปรุงแล้วแสดงให้คณะผู้เชี่ยวชาญในแบบแสดงความคิดเห็นรอบที่ 2 และตัดสินว่าตัวชี้วัดรายการนั้นได้มติเอกฉันท์ เมื่อผู้เชี่ยวชาญแสดงความคิดเห็นระดับ 4 หรือ 5 มากกว่าร้อยละ 70 (8 ใน 11 คน)*

ผลการศึกษา: *ในการแสดงความคิดเห็นรอบที่ 1 มีตัวชี้วัด 53 รายการ ตัวชี้วัดสมรรถภาพการดูแลที่ห้องฉุกเฉินและเมื่อรับไว้รักษาในโรงพยาบาล 48 ชั่วโมง มีอย่างละ 4 ด้าน เมื่อคณะผู้เชี่ยวชาญแสดงความคิดเห็นรอบที่ 2 แล้วมีตัวชี้วัดที่ได้มติเอกฉันท์ คือ ตัวชี้วัดสมรรถภาพการดูแลที่ห้องฉุกเฉิน จำนวน 21 รายการและเมื่อรับไว้รักษาในโรงพยาบาล 48 ชั่วโมง จำนวน 14 รายการ*

สรุป: *สร้างตัวชี้วัดสมรรถภาพการดูแลที่ห้องฉุกเฉิน จำนวน 21 รายการและเมื่อรับไว้รักษาในโรงพยาบาล 48 ชั่วโมง จำนวน 14 รายการ โดยใช้กระบวนการ Delphi technique ซึ่งผู้วิจัยจะใช้ตัวชี้วัดนี้ในงานวิจัยขั้นต่อไป*