Desired clinical applications of artificial intelligence in Emergency Medicine: an international e-Delphi study

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INTRODUCTION

Artificial intelligence (AI) in healthcare has been advancing rapidly over the past decade, with the potential to transform the field of medicine. Implementation of AI to improve emergency care has been increasingly explored, ranging from pre-hospital care and resource management to triage, imaging interpretation, diagnostics and prognostication.

However, AI solutions are often designed by developers without consideration of the needs of the end users.

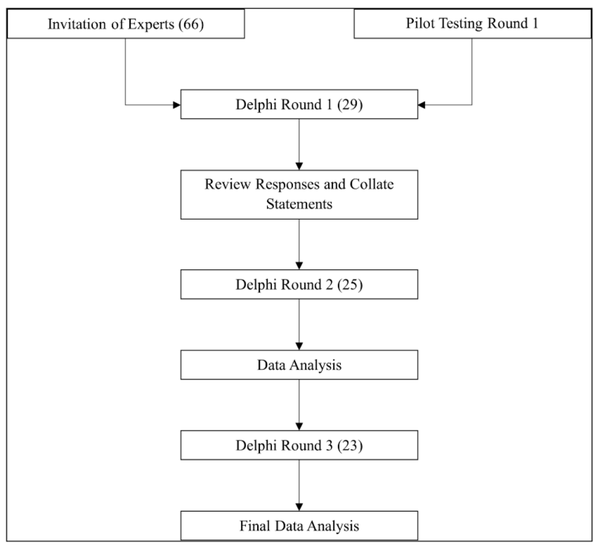
Our study therefore sought to explore desired clinical applications by experts in emergency medicine through consensus-building, thus laying the foundation for and driving future research and innovation.

STUDY DESIGN

A 3-round Delphi process was undertaken using STAT59 software.

An international expert panel was assembled through purposeful sampling to reflect a diversity in geography, age, time in practice, practice setting, role, and expertise.

Figure 1. Flow chart of Delphi process



METHODS

Items generated in Round 1 were collated by the study team and ranked in Rounds 2 and 3 on a 7-point linear numeric scale of importance. Consensus was defined as a standard deviation of 1.0 or less.

Table 1. Expert characteristics

Characteristic	No. of Experts (%)
Age	
<=35	5 (17%)
36-54	13 (45%)
>55	6 (21%)
Did not respond	5 (17%)
Years in Practice	
<=5	4 (14%)
6-10	5 (17%)
11-20	6 (21%)
21-30	2 (6.9%)
>30	4 (14%)
Did not respond	8 (28%)
Gender	
Female	8 (28%)
Male	21 (72%)
Region	
Asia	2 (6.9%)
Europe	3 (10%)
North America	22 (76%)
Australia/Oceania	2 (6.9%)
Practice Setting	
Large urban academic	20 (69%)
Large urban non-academic	4 (14%)
Small urban	1 (3.4%)
Rural	4 (14%)

RESULTS

Of 66 invited experts, 29 completed Round 1, 25 completed Round 2, and 23 completed Round 3. Three statements reached consensus in Round 2 and four statements reached consensus in Round 3, including safe prescribing, guiding choice of drug, adjusting drug doses, identifying risk or prognosis, and reporting/interpreting investigation results.

Table 2. Statements reaching consensus

Statement	Mean (1-7)	Standard Deviation
Round 2		
Artificial intelligence to interpret imaging studies	6.3	0.8
Artificial intelligence to guide medication prescribing for patients who are pregnant or lactating	6.2	0.8
Artificial intelligence guidance for antibiotic choice	5.9	1.0
Round 3		
Artificial intelligence to assist with language translation	6.4	1.0
Real-time analysis of cardiac monitoring by artificial intelligence	5.6	1.0
Artificial intelligence guidance of differential diagnoses for rare conditions	5.3	1.0
Artificial intelligence estimation of patient's risk if discharged	5.2	0.8

Highest Rated Statements

Table 3. Applications of AI felt to be important by emergency physicians

Statement	Mean (1-7)	Standard Deviation
Artificial intelligence-guided identification of medication interactions	6.1	1.3
Artificial intelligence guidance to improve patient flow through the department	5.6	1.2
Artificial intelligence guided identification of patients with sepsis	5.5	1.2
Artificial intelligence-guided summaries of the patient's medical chart	5.5	1.2
Artificial intelligence to guide management of febrile infants	5.4	1.3
Artificial intelligence-guided identification of patients at risk of deteriorating	5.3	1.4
Artificial intelligence to guide adjustment of medication doses based on renal function	5.3	1.5
Artificial intelligence guided interpretation of electrocardiograms	5.3	1.6
Artificial intelligence-guided investigations at triage	5.2	1.2
Artificial Intelligence guidance for staffing in the emergency department	5.2	1.2
Artificial intelligence to monitor high-risk discharges in the community	5.1	1.2

Lowest Rated Statements

Table 4. Applications of AI felt to be unimportant by emergency physicians

Statement	Mean (1-7)	Standard Deviation
Artificial intelligence-guided insertion of chest tubes	2.4	1.5
Artificial intelligence to guide management of musculoskeletal injuries	3.1	1.1
Artificial intelligence to identify candidates appropriate for iron infusion	3.6	1.6
Artificial intelligence to estimate risk for patients who leave without being seen	3.7	1.5
Artificial intelligence assistance in choice of drugs for intubation	3.7	1.5
Artificial intelligence guidance for sedation medications	3.7	1.3
Artificial intelligence to guide management of patients with asthma	3.7	1.3
Artificial intelligence to guide management of cardiac arrest	3.8	1.7
Artificial intelligence to guide need for lumbar puncture in suspected subarachnoid hemorrhage	3.8	1.7
Artificial intelligence guidance for selecting the appropriate imaging modality	3.8	1.6
Artificial intelligence guided risk prediction for delirium	3.9	1.3

CONCLUSIONS

- Many desired clinical applications of AI in emergency medicine have not yet been explored.
- Clinical and technological experts should co-create new applications to ensure buy-in from all stakeholders.
- Specialty organizations can lead the way by establishing local clinical priorities.

Conflict Disclosure: JMF is the CEO and Founder of STAT59