
Reviewing triage at a busy emergency department

Samarakoon S.^{1,2}, Chia J.², Yi LS.², Sim N.², Kiat Kenneth TB², Anantharaman V.²

¹National Hospital, Colombo, Sri Lanka

²Singapore General Hospital, Singapore

INTRODUCTION

Triage is used in Emergency Departments (EDs) to enable available resources to match emergency care demands¹. Time for triage should be short so that patients' clinical complaints are evaluated as quickly as possible². Managing the triage process involves the commitment of space, human resources, and processes to distribute patients timely to the appropriate ED areas. EDs have little control over the rate and number of patients presenting at their doorstep. ED triage systems worldwide vary in manner and implementation¹. All subscribe to the concept of minimal waiting before being seen by the care team and require periodic reviews of their processes. Such a review was carried out at the ED of a large tertiary care hospital in Singapore in January 2020. We describe the review processes undertaken, their results, and measures suggested to improve the triage system.

METHODS

This review was conducted in three steps. First, documentation of ED processes was done over two weeks in January 2020 by documentation of 30 patient journeys. Second, a one-month period was spent observing triage processes, documenting issues, and conducting analyses of these. Flow diagrams and fishbone analysis were used to identify causes for long waiting and

process times. Discussions were conducted with the triage nurses. Third, timings (from arrival at fever screening, start and end of fever screening, movement to triage waiting area, triage start, leaving triage area, and end of registration) were obtained from the Electronic Medical Records (EMR) system, for all patients, that month.

Data was captured in Excel. All patient data were anonymized. Simple data analysis was conducted. The procedures were approved by the Head of the Department as a quality audit of the ED's processes and exempted from the Institutional Research Board review.

RESULTS

Current ED process

The current processes comprising ED triage, from patient arrival to doctor consultation, are in four phases as follows:

- A) From ED arrival till pre-fever-screening
 - a. The patient arrives, either by ambulance, private transport or walks-in
 - b. ED triage nurse evaluates whether patients are critically ill for immediate identification as P1
 - c. The others join the queue for fever screening
 - B) Fever Screening in the ED
 - a. This is performed by a trained Patient Care Assistant (PCA).
-

- b. For those with a Singapore National Registration Identity Card (NRIC), this is scanned to allow a brief initial patient registration. The Department's EMR system auto-fills the patient's critical medical and patient demographic information. For those without an NRIC, the name, date of birth, gender, and citizenship are documented allowing temporary registration.
- c. The PCA screens the patient for temperature, fever/flu-like symptoms, travel history, and symptoms.
- d. Patients with infectious-like symptoms are isolated and escorted to the ED's Isolation Area (Fever Area).
- e. The PCA documents the patient's next-of-kin (NOK) name, relationship, and contact number.
- f. A patient queue number is then generated. There are three patient

queues, a general queue, a fever queue, and a priority queue.

- g. The queue number is given to the patient. Patients with an NRIC are directed to the triage waiting area. Those without are directed to the registration waiting area before being triaged.

C) Actions at Triage Area

- a. The triage nurse calls the patient by queue number. Priority patients are triaged earlier. The nurse confirms the patient's identity by checking two identifiers (name, NRIC, or queue number).
- b. Questions asked by the triage nurse include chief complaints, fall risk, pain scale, recent travel history, drug allergy, and previous medical history. If a drug allergy is recognized, a red tag is attached to the patient's wrist. For fall risk, a yellow tag is added. If none of these, a

Table 1: Emergency Department Patient Triage Categories, Mode of Arrival and NRIC Status

Triage Category	Number of Patients n (%)	Mode of Arrival			NRIC Status	
		Emergency Ambulance n (%)	Non-emergency Ambulance n (%)	Other Transport n (%)	With NRIC* n (%)	Without NRIC* n (%)
Priority 1	1387 (13.0%)	541 (37.1%)	72 (17.3%)	774 (8.8%)	1276 (14.4%)	111 (6.3%)
Priority 2	5955 (56.0%)	864 (59.3%)	310 (74.7%)	4781 (54.6%)	5204 (58.7%)	751 (42.5%)
• P2**	5814					
• P2 Fever***	141					
Priority 3	3250 (30.6%)	52 (3.6%)	33 (8.0%)	3165 (36.1%)	2364 (26.7%)	886 (50.1%)
• P3#	2932					
• P3 Fever##	318					
Priority 4	43 (0.4%)	0	0	43 (0.5%)	23 (0.2%)	20 (1.1%)
TOTAL	10635 (100%)	1457 (100%)	415 (100%)	8763 (100%)	8867 (100%)	1768 (100%)

*NRIC = National Registration identity card (Those without NRIC were usually non-citizens, work-permit holders, and tourists), **P2 = Priority 2, ***P2 Fever = P2 patients triaged to Fever Area, #P3 = Priority 3, ##P3 Fever = P3 patients triaged to Fever Area

- white wrist tag is used.
- c. The nurse measures the patient's vital signs (pulse rate, respiratory rate, blood pressure, oxygen saturation, and pain score).
 - d. Subsequently, the triage category is determined (whether P1, 2, 3, or 4). P1 and P2 patients are immediately placed on a trolley and wheeled into these areas.
 - e. Indicated procedures, e.g. an electrocardiogram (ECG), nebulization, bandaging, splinting of wounds, or glucose drinks if low blood sugar, would be done before the patient is taken to appropriate care areas.
 - f. The Triage Nurse then passes a sheet explaining the ED journey, and queue number to the patient places the patient's folder with patient stickers on the Registration Counter and indicates to the patient how to get to the Ambulatory area after completing registration.

D) Patient registration begins when the

Registration counter staff calls either the patient or NOK (in cases of patients in P1 or P2). Counter staff conducts the final stages of registration and financial counselling, if any, at the patient's bedside for those in the trolley area without NOKs. Counter staff update patient particulars, print additional sticky labels, and direct patients to the waiting area to await doctor consultation.

Characteristics of patients seen

Table 1 shows patient numbers seen by triage category, fever status, mode of arrival, and NRIC status. ECGs were done at Triage for 59 % of ambulance patients versus 15% of self-referrals.

Time management for the triage process

Table 2 shows mean waiting and process times from fever screening until completion of patient registration and triage. There was no significant difference for this phase

Table 2: Time Management of the ED Patient from arrival to presentation at patient care area

Process	Median Time (minutes)	95th Percentile Time (minutes)
Waiting for Fever Screening	0	1.2
Conduct of Fever Screening	2.0	3.1
Waiting for Triage	6.0	19.2
Conduct of Triage	7.0	19.5 (43.0)
Waiting for Patient Registration (for NRIC Holders)	1.5	14.8
Conduct of Patient Registration (for NRIC Holders)	2.0	5.0
Total waiting time for NRIC Holders	18.5	62.8
Waiting for Patient Registration (non - NRIC Holders)	3.0	5.0
Conduct of Patient Registration (non - NRIC Holders)	2.0	5.0
Total Waiting time for non -NRIC Holders	20.0	53.0

amongst patients eventually sent to the P2, 3, or 4 areas.

Triage issues and concerns identified

The following were observed during the various processes:

At Fever Screening Area

1. Collection of non-fever related information, such as chest pain, stroke, or pain elsewhere
2. Some patients were converted to a trolley during fever screening before the conduct of triage
3. General information on the location of facilities and advice to patients / NOKs making enquiries was being provided by screening staff
4. Fever screening staff sometimes left their desk to provide patients directions, even when the screening area was full.

At Triage Area

1. Triage nurses were doing many ECGs, and sometimes accompanying patients to other care areas.
2. Nurses were taking detailed clinical histories, accompanying patients to the registration area, and helping patients complete the registration process.

Root Cause Analysis

The process flow diagrams and fishbone analysis identified factors that contributed to waiting and process times. Four areas that contributed to delays in the overall triage process were considered, viz. people, place, policy, and process. The findings were as follows:

1. People
 - a. Frequent absence of Triage Nurse leader owing to being required in other ED areas

- b. Assuming multiple roles, some not triage related, e.g. information provision and dissemination
 - c. Understaffing of nurses and porters resulting in nurses assuming portering functions and slowing down the triage process, especially during peak periods
2. Place
 - a. Space at triage did not allow adequate social distancing of potentially infectious patients
 - b. Not all four triage cubicles functioned fully, owing to nurses frequently leaving to perform other duties
 - c. Insufficient seating for patients and NOK, especially during peak periods.
 - d. No proper Welcome/Information process at the ED entrance leading to patients and NOK making frequent enquiries from fever screening and triage staff.
 - e. Direction signages for patients / NOK in the area are inadequate to smoothly guide spontaneous patient movement.
 - f. Insufficient wheelchairs for patients with walking difficulty.
3. Policy
 - a. Variations in triage decision-making were noted amongst nurses
 - b. No system of regular audit for the triage process
4. Process
 - a. Patients arriving at the ED were providing illness-related information at least twice, at Triage and again at the patient care area.
 - b. ECGs, once done, were sent to the P2 area by the triage nurse for checking by a senior ED physician with the nurse walking from Triage to P2 many times.

- c. The ED did not keep spares to replace faulty equipment in Triage at short notice.

DISCUSSION

The ED had made previous attempts to better understand and improve triage processes⁴. Other countries have also tried to address waiting time issues at their EDs^{5,6,7,8}. These identified minimizing the need for patients to repeat themselves to multiple sets of clinical staff and minimizing waiting before a doctor evaluates the patient. One needs to consider whether patients may self-enter, electronically, their clinical complaints so that further questioning by clinical staff would be to verify initially available information and ask necessary related additional questions.

To address fluctuations in patient arrival patterns, careful manpower planning for regular staffing and surge capacity flexibility will be required. Manpower requirements may be determined using process-based time norms adjusted with mathematical modeling and queuing theory applications in a simulated environment^{9, 10, 11, 12}. Nurses in Triage should be focused on their triage roles and not be distracted by other duties. Busy EDs may need the constant presence of a senior Nurse leader to oversee triage processes daily.

EDs are often regarded as the shop-window of the hospital. There is a need to consider a Welcome/Information desk at the ED entrance to not only serve as a welcome counter¹² but also provide queue numbers,

information to all arrivals on ED processes, and better ensure no patient is left wondering where to go next. Signages for patients and NOKs should be reviewed for greater clarity on the triage process and patient registration requirements.

The need to ask non-fever related questions during fever screening¹³ requires review to minimize screening time.

Traditional ED patient triage systems are nurse-based. Some EDs have tried senior Emergency Physician (EP) led triage systems^{14, 15, 16}. These usually include teams of 1 senior EP with 2 senior nurses who take a quick history, perform a rapid and focused physical examination, order initial investigations and treatments to relieve pain, breathlessness, and other acute symptoms, administer these and move patients to the next area in the ED based on clinical priority. These require physical, human, and electronic infrastructural changes and hold the promise of shorter waiting times for doctor consultation, earlier initiation of investigations and treatments, earlier resolution of distressing symptoms, and a shorter time in the ED with the potential to reduce ED overcrowding. Nurse practitioner models have been tried in other jurisdictions with varying success^{17,18}.

With ambulances bringing in a significant proportion of ill patients to the ED, we should consider bringing forward and conducting fever screening, triaging and vital sign measurements in ambulances while on the

way to the hospital¹⁹. If feasible, the impact on time savings in the ED is potentially significant.

Patients should not be queueing up for registration. Instead, decentralizing counter staff to register either at triage, while being seen by the doctor, or when waiting for procedures may be time-saving. Patients want seamless bedside registration in EDs²⁰. Unlike triage, patient registration not being mission-critical, but an administrative necessity, can be built into the overall patient care function, rather than consume precious patient time. Finally, triage should not be delayed for patients without local NRICs if we consider it time critical.

This review which was done in one of the world's best emergency care systems shows many identified interventions which can be practiced in Sri Lanka. Emergency care is a growing field in Sri Lanka. Experience gained during this process of auditing can be applied for upgrading current emergency care services provided at the institutional level.

CONCLUSIONS

In both emergency care setups in Singapore and Sri Lanka, periodic reviews and audits of triage processes are useful to increase their functional efficiency and better ensure a smoother and hassle-free experience for patients arriving at the ED. The availability of patient flow timings, close observations of current practice, and interviews with stakeholders all help to provide the ED with

tools to initiate change and speed up emergency patient care.

REFERENCES

1. Christ M, Grossmann F, Winter D, Bingisser R, Platz E. Modern triage in the emergency department. *Dtsch Arztebl Int* 2010; 107(50): 892–8. DOI: 10.3238/arztebl.2010.0892
2. Bukata R. Has triage become an intrusive waste of time? *EM Abstracts*; 12 June 2015. Available at: <http://epmonthly.com/article/has-triage-become-an-intrusive-waste-of-time/>. Last accessed 9 October 2020
3. Emergency Care – Singapore General Hospital [Internet]. Available: <https://www.sgh.com.sg/patient-services/pages/emergency-care.aspx> [Accessed 8 October 2020].
4. Shen Y, Lee LH. Improving the wait time to triage at the emergency department. *BMJ Open Quality* 2020;9:e000708. doi:10.1136/bmjok-2019-000708
5. Kumar A, Lakshminarayanan D, Joshi N, et al. Triageing the triage: reducing waiting time to triage in the emergency department at a tertiary care hospital in New Delhi, India *Emerg Med J*. 2019;36:558–563.
6. Houston C, Sanchez L, Fischer C, et al. Waiting for triage: unmeasured time in

- patient flow. West J Emerg Med 2015; 16 (1) : 39 - 42 , doi:10.5811/westjem.2014.11.22824.
7. Boudi FB. Reducing Wait Time in the Emergency Department. Editorial. Federal Practitioner. July 2014; 14-15
8. Lena Burström, Marie-Louise Engström, Maaret Castrén, Tony Wiklund & Mats Enlund (2016) Improved quality and efficiency after the introduction of physician-led team triage in an emergency department, Upsala Journal of Medical Sciences, 121 : 1 , 38 - 44 , DOI:10.3109/03009734.2015.1100223
9. Chowdhury NM, Riddles L, Mackenzie R. Using Queuing Theory to Reduce Wait, Stay in Emergency Department. American Association for Physician Leadership. September 14, 2018: 1-20. Available at: <https://www.physicianleaders.org/news/queuing-theory-reducing-wait-stay> . Last accessed 5 October 2020.
10. Mission Health. Emergency Department Triage Redesign Dramatically Reduces Wait Times, LOS, and Left Without Being Seen Rates. 2017. Health Catalyst. Available at : <https://downloads.healthcatalyst.com/content/uploads/2017/08/Emergency-Department-Triage.pdf> . Last accessed 7 October 2020.