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# Improving the wait time to triage at the emergency department

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## ABSTRACT

Triaging of patients at the emergency department (ED) is one of the key steps prior to initiation of doctor consult. To improve the overall wait time to consultation, we have identified the need to reduce the wait time to triage for ED patients. We seek to determine if the implementation of a series of plan, do, study, act (PDSA) cycles would improve the wait time to triage within 1 year. The interventions related to the PDSA cycles include the refining of triage criteria, 'eyeball' triage by senior nurses to facilitate direct bedding of patients, formation of a triage nurse clinician role, and a needs analysis of required nursing manpower. The baseline period for this study was from January 2017 to April 2017, with the results following implementation of the respective PDSA cycles sequentially tracked from May 2017 to March 2019. There was an improvement in the wait time to triage from a baseline duration of 18 min to the postimplementation period duration of 13 min, with a 25% decrease in variance from 16 to 12 min. The improvements were sustained. Strategies to further reduce wait time to triage at the ED are discussed. We also highlight the importance of adequate triage manpower, data-driven decision making and continued engagement of stakeholders in enabling positive outcomes from this quality improvement effort.

## PROBLEM

Emergency departments globally are faced with increased patient load[1] and expectations. The need to balance limited resources against the provision of timely patient care has led to multiple efforts to optimise processes at emergency departments. The wait time to consultation is one of the key metrics tracked at the emergency department as a surrogate marker of timeliness and care quality.[2]

In a prior quality improvement effort, we have carried out a series of interventions to optimise the wait time to consultation.[3] In the process of that quality improvement effort, we have identified key upstream processes like patient registration and triaging, which are performed prior to the initiation of doctor consult, as being important issues to improve, to further reduce the wait time to consultation.

Although triage of emergency department patients is meant to be a quick process of sorting patients to their relevant downstream emergency department resource,

it has been found to be a possible source of delay[4] within the patient's journey at the emergency department. Similar to other emergency departments, there have been multiple efforts over the years to optimise the process of triaging[5] at our emergency department. During our prior efforts to improve the wait times to consultation, we have identified significant variance in the wait times to triage, both within an intraday setting and across the days of week.

## BACKGROUND

Singapore General Hospital (SGH) is the largest public hospital in Singapore, with 1600 inpatient beds. The Department of Emergency Medicine (DEM) sees more than 125 000 patients annually. On arrival, walk-in patients are first screened for conditions requiring direction to the isolation area, before being directed to undergo a quick registration, which allows electronic documentation of the patient's visit to the emergency department to be initiated. Patients brought in by ambulance are directly brought to patient care areas for concurrent registration, triage and evaluation.

The patients are triaged according to the nationally used Patient Acuity Category system,[6] which is a four-level triage system (P1, P2, P3 and P4) that streams patients according to the acuity and severity of their presenting complaints, with P1 patients being patients who require immediate management and resuscitation, to P4 patients who present with non-emergency conditions.

Examples of P1 patients include those presenting with cardiac arrest, acute myocardial infarction and acute respiratory failure requiring mechanical ventilation. P2 patients include those with significant medical conditions such as acute stroke, fluid overload and sepsis. P3 patients include those who present with non-limb threatening fractures, minor head injury and mild asthma exacerbations. P4 patients generally present with non-emergent medical conditions such as upper

respiratory tract infections, suture removal or medication refills

After triaging is performed, the walk-in patients are directed to their patient care areas. They may intermediately have point of care tests (urinalysis, ECG, laboratory investigations or X-rays) performed, prior to initiation of consultation. Quick registration and triaging is performed at the same front facing area of the department.

There are two quick registration counters manned by patient care assistants and four triage rooms manned by staff nurses who have undergone an official triage training course and are accredited to perform emergency department triage. Staffing of the said areas are dependent on the expected patient arrival patterns by time of day, with more staff rostered to periods when patient arrivals increase.

We have defined the wait time to triage as the time from quick registration to the time of initiation of triage, as captured in the electronic health record system. To further improve the wait time to consultation, we aimed to reduce the average wait time to triage for all walk-in patients from 18 to 10 min within 1 year.

A root cause analysis was first conducted to identify reasons contributing to the wait time to triage. Causes were defined into two main categories—intradepartmental causes and wider systemic-level causes. Major intradepartmental causes identified included triage nurses not being staffed consistently to patient arrival trends, different levels of staff experience with triaging and variability of triaging outcomes between triage nurses.

The main systemic causes identified included the limited physical space relative to patient load, and the lack of ancillary staff to assist the triage nurses to perform non-triage-related actions at the triage area. The duration for triaging was prolonged as triage nurses may perform multiple non-triage-related tasks such as transfer of patients from wheelchair to trolley and tasks which may require prolonged duration, such as performing an ECG and having the ECG vetted in person by a senior doctor, before being able to move on to triage another subsequent patient.

## BASELINE MEASUREMENT
Baseline data from January 2017 to April 2017 were collected, and analysis of 23 000 emergency department patient visits of all triage acuities was done. Walk-in patients who arrived during the period of 9:00 to 21:00 hours were chosen as our target group of participants as they represent the morning, afternoon and evening waves of patients who would enter the triage area (figure 1).

The average number of walk-in patients amount up to 315 patients daily. The baseline weekly average wait time to triage of these patients stands at 18 min. Patients brought in by ambulances were not included in these analysis as they are moved to the patient care areas and are generally triaged within 10 min of arrival.
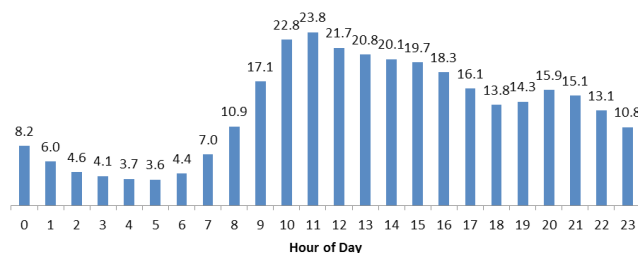
**Distribution of Walk-In DEM Patients (Average)**



**Figure 1** Intraday patient arrival trends. DEM, Department of Emergency Medicine.

## DESIGN
The team was led by an emergency physician, three emergency department assistant nurse clinicians and two analysts from the hospital's organisation planning and performance department. The team was further supported by database analysts, who provided data for baseline analysis. Continued support from nursing leadership and the head of the DEM was essential in enabling interventions to be placed and sustained.

With data from the baseline analysis, feedback was sought from triage nurses on the ground to ensure that planned interventions were implementable and addressed their needs. Like our prior efforts to improve the wait time to consult, patient safety remained the paramount consideration in this quality improvement effort. The areas of improvement targeted were mainly the intradepartmental causes. Rapid plan, do, study, act (PDSA) cycles were used.

## STRATEGY
### PDSA cycle 1 (May 2017)
The emergency department, as part of a tertiary hospital, has steadily seen increases in the proportion of more complex and higher acuity patients. The increase in quantity of more complex and higher acuity patients resulted in the practice of 'subtriaging' the less complex or acute P2 patients, as the physical space within the trolley area grew to be inadequate from the increase in numbers of patients who were triaged as P1 and P2.

These group of patients, who used to be triaged to the trolley patient care area by default, were now variably triaged to the ambulatory area. We noted differences in practice between individual triage nurses. Together with different levels of experience in triage for the triage nurses, this led to a variability in triage outcomes, which affected downstream provision and allocation of resources for patient care.

To address this issue, the team, with inputs from senior doctors within the department, identified groups of patients within the higher acuity triage categories, who could be triaged safely to the ambulatory area and tagged for expedited care. A document stating the ambulatory P1 and P2 criteria was defined. It was endorsed by the

departmental head and subsequently disseminated by the department nursing triage team leaders to the triage nurses.

Examples of ambulatory P1 and P2 patients include patients with suspected acute glaucoma, non-high-risk chest pain, abdominal pain and breathlessness. The presence of a formalised triaging criteria helped reduce ambiguity and the time taken to reach a triage decision by the triage nurses. The importance of compliance to the said triage criteria was emphasised to the triage nurses after the implementation of the ambulatory P1 and P2 triage criteria.

## PDSA cycle 2 (October 2017)
Patient arrivals could range up to 30 new walk-in patients per hour during the peak periods. This leads to periods of congestion at the triage area and contributes to increased wait time to triage, as nurses at the triage often had to address the queries of the crowd of patients in the queue for triage, together with the need to actively continue triaging patients.

To reduce the number of patients awaiting triage at the triage area, senior triage nurses were instructed perform a quick 'eyeball' triage of the newly registered walk-in patients and transfer patients who required trolley area care directly to the trolley area, where separate downstream teams of nurses and doctors were available to initiate triage and patient care respectively. Direct bedding of patients is one of the known interventions at emergency department to be effective in improving overall emergency department flow.[7]

Patients who required care at the trolley area, such as those with drowsiness, severe pain, respiratory distress and acute limb deformities were easily identifiable with 'eyeball' triage. Frail and elderly patients, with potentially significant complaints of altered mental state, frequent falls, bleeding symptoms were also identified by coupling 'eyeball' triage with brief history taking, and direct bedded to the trolley area.

This was important in decongesting the triage area and reducing the wait time to triage during periods of high patient arrivals, which occur daily from 9 o'clock in the morning until the evening. Walk-in patients, who require trolley care and tend to be more ill, could be identified earlier for transfer to patient care areas for evaluation and management to be initiated.

## PDSA cycle 3 (February 2018)
Ground feedback continued to reflect the problem of congestion at the Triage Area despite efforts to decant the area with 'eyeball' triage by senior triage nurses during peak patient arrival periods. Senior triage nurses were often too busy triaging patients to identify patients for direct transfer to the trolley area. There was also continued variability in the output of each triage nurse, with the fastest triaging up to twice the number of patients, compared with the slower group.

To address these two issues, a triage nurse clinician role was created, where a nurse clinician would be rostered to the triage area to facilitate direct trolley area transfers for suitable patients within the pending triage queue, provide guidance to the less experienced triage nurses, and ensure staffing of the triage area remains consistent and adequate to meet incoming patient arrivals. The wait time to triage and the corresponding load, according to the triage nurse clinician shift timings, was tabulated for audit, feedback and enable the identification of systems related issues.

## PDSA cycle 4 (June 2018)
Despite the earlier PDSA cycles, improvements in the wait time to triage were not sustained. Ground surveys confirmed the variability in staffing at triage. Nurses at triage were often called away to help perform other tasks in other areas of the emergency department. Analysis of triage wait times showed a correlation between increased triage wait time duration to periods when the triage area was not optimally staffed.

To form an objective picture of the nursing activities within the emergency department, a needs analysis using direct, on-site observation was performed. The types of nursing activities at each patient care area within the emergency department were categorised, together with the average duration required of each activity, and corresponding nursing manpower required.

The findings of the needs analysis were communicated to the nursing leadership in February 2018 to request for additional nursing manpower to adequately cover the required nursing activities. The nursing roster was also optimised in a data-driven manner, titrated to intraday patient arrival trends. Additional nursing manpower was approved and allocated to the department from June 2018. This enabled more consistent staffing of the triage area and reduced the incidence of triage nurses being called away to perform non-triage-related activities at other areas of the emergency department.

## RESULTS
The weekly average wait time to triage is represented in the run chart (figure 2) showing the period from baseline (January 2017) to postimplementation of the initiatives (March 2019). With implementation of the above-mentioned PDSA cycles, there was a resultant 28% reduction in the weekly average wait time to triage from 18 to 13 min ($p<0.01$). There was also a corresponding 25% reduction in the variance (represented by the SD) of the wait time during the same period, from 16 to 12 min.

The sustained reduction in the average and variance of wait times observed after implementing PDSA cycle 4 confirms the staffing at triage as the main limiting factor. However, without the previous steps taken in PDSA cycles 1–3 to ease the patient flow from triage area to downstream patient care areas, we would not have achieved the observed reduction in wait time to triage.
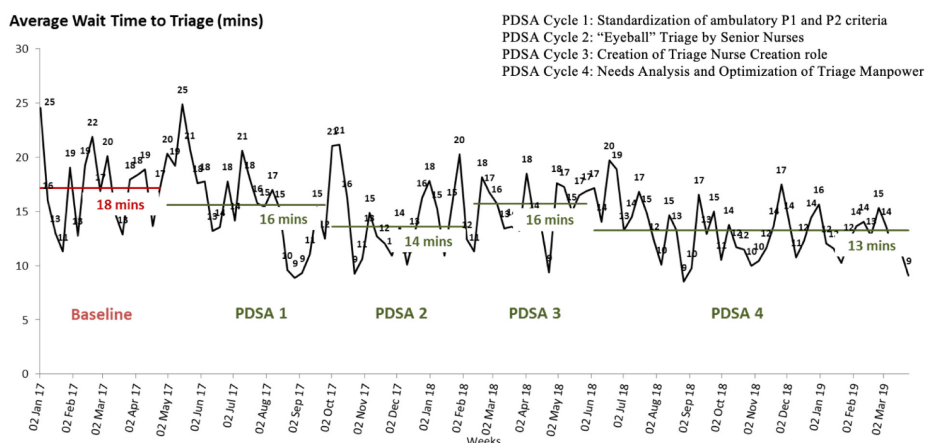
**Figure 2** Progress of average wait time to triage with respect to PDSA cycles. PDSA, plan, do, study, act.

The introduction of the 'eyeball' triage and creation of the triage nurse clinician role improved triage efficiency and capabilities. Despite not meeting the original goal of reducing the wait time to triage from 18 to 10 min within 1 year, this quality improvement effort has resulted in better operational outcomes, creation of defined triage practices and facilitated the teaching of less experienced triage nurses.

Overall, staff feedback has been positive after implementation of these interventions. Triage nurses appreciated the standardisation of triage criteria, the provision of experienced nurses who provide guidance to the less experienced triage nurses and the effort to ensure adequate manpower coverage for the triage area, especially during the the busier periods of the day when patient attendances peak.

Balancing measures tracked included the wait time to actions performed by nurses (such as serving of medications and completion of procedures) and wait time to admission for patients. Both metrics depended heavily on nursing inputs and intervention. The increased numbers of nurses being allocated for triaging duties did not result in any effect on either metric.

## LESSONS LEARNT

Having a relatively large pool of nurses triage patients with only the briefest of interactions, coupled with their differing individual experience levels, made reducing the variability in triaging outcomes[8][9] a constant challenge despite efforts taken across the PDSA cycles.

Possible means to meet this challenge include assigning identified high-output triage nurses more frequently to periods of expected peak patient arrivals, growing the concept of direct bedding to more patients to further decant a crowded triage area, or employing the use of technology like artificial intelligence infused triage assistants or a more intuitive software interface to improve ease of use of triaging modules for staff.

Reducing the number of non-urgent point of care tests performed at triage has been identified as a potential future area of improvement. There is an ongoing review of point of care tests to be done at triage, to better balance the front loading of investigations against the need to manage triage wait times.

## LIMITATIONS

Due to the retrospective manner and the operational nature of the data collected, we were unable to elucidate more granular details regarding triage staff to patient interactions for determining the finer reasons which may lead to a prolonged wait time to consultation. Given the heterogeneous population mix that SGH serves, it is not inconceivable that factors such as language barriers, physical and communication disabilities or demanding patients and relatives could have contributed to unavoidable prolonged triage encounters and triage wait times.

Infrastructural limitations remained a major cause for congestion at the triage area. This was evident from the increases in triage wait times during periods of peak patient arrivals. Although the situation has improved with the optimised staffing at triage and the early decanting of patients pending triage to the trolley area, there remained instances where a sudden surge in patient arrivals above average norms leads to the inevitable prolonging of triage wait time, despite the staffing of all available triage cubicles.

The lack of ancillary staff to help triage nurses with tasks related to patient transfer, patient movement and the performing of non-triage-related actions such as having an ECG done for patients, was a common refrain from the ground through the course of this improvement effort.

Apart from considering the increase in ancillary healthcare manpower, we are looking to re-examine the model of care and consider further reducing patients' footprint at the triage area by implementing a direct bedding concept where a wider group of patients with defined complaints are directed to patient care areas for management, bypassing a resource-limited triage section.

## CONCLUSION

Improving the wait time to triage is important because it contributes to reduce overall wait times, emergency department congestion and a better patient experience.[10] We have demonstrated that root causes for prolonged triage wait times are multifactorial and require multi-pronged interventions.

Like our prior quality improvement effort, the presentation of relevant, actionable data and the continued engagement of stakeholders allowed the team to move forth with the PDSA interventions in a sustainable manner. Even as this effort concludes, the team has continued to engage the relevant stakeholders, both within the department and at across the wider hospital, to further address and improve the issues identified.

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