



## Short Communication: Improving Timeliness of Analgesia for Acute Trauma-Related Pain in the Emergency Department Green Zone — A Quality Improvement Initiative

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### Abstract

**Background:** Emergency Department (ED) overcrowding is a perennial issue in Malaysia. Non-critical, lower-acuity patients in the Green Zone often face long wait times, which frequently leads to institutional oligoanalgesia (delayed or inadequate pain relief). **Objectives:** This short communication outlines a Quality Improvement (QI) work flow proposed by the author to clear departmental bottlenecks. The main target is to bump up the percentage of Green Zone patients with acute trauma-related pain who get their pain relief within 90 minutes of registration. This framework serves as a suggested model for other public hospitals looking to improve their ED (Emergency Department) throughput. **Methods:** Using the Nominal Group Technique (NGT) and SMART prioritization criteria, the author evaluated key departmental issues and selected delayed pain management as the priority target. A strict Model of Good Care (MOGC) was designed to run through a rapid implementation timeline from July 2026 to August 2026. Data collection plans include pulling timestamps from the Electronic Health Record (EHR) system and handing out targeted questionnaires to frontline staff. **Conclusion:** By sorting out the fragmented department layout, introducing decentralized analgesia sub-stores/carts directly inside the Green Zone, and conducting proper staff briefings, this model establishes a practical, sustainable work flow to hit our national KKM QA benchmark of  $\geq 70\%$  compliance.

**Keywords:** Emergency Department (ER); Green Zone; Trauma-Related Pain; Quality Assurance (QA)

### Introduction

In any ED, managing a patient's pain promptly is a basic benchmark of quality care. However, because our public hospitals are always packed, ambulatory or non-critical Green Zone patients presenting with painful injuries often end up waiting the longest for pain relief (Ithnain *et al.*, 2026). Leaving these patients to bear with acute pain is not ideal—it triggers unnecessary physiological stress, causes immense distress, and unnecessarily prolongs the overall ED Length of Stay (LOS).

This quality improvement initiative targets specific work flow failures within the non-critical stream (Green Zone) of the ED. Following the guidelines in Kementerian Kesihatan Malaysia's QA/QI Workbook: The Problem-Solving Approach (MOHM, 2020) and the Pain Management in ETD (COEP, 2020) clinical manual, this suggested model looks at resolving institutional oligoanalgesia through practical process re-engineering. For operational clarity, the Green Zone applies to patients with an

initial pain score < 4; Acute Pain refers to symptoms lasting less than 1 month post-injury; and Trauma-Related Pain means any physical injury or discomfort directly resulting from an external trauma event (like road traffic accidents, falls, or workplace mishaps).

## Methodology

### Problem Prioritization via Nominal Group Technique

To find a focused solution, the author initially reviewed frontline vulnerabilities via common incident reports, audits and operational data in his working centre and listed down seven major operational vulnerabilities currently bugging typical public emergency departments:

- Green Zone waiting hour stretching over 90 minutes (Mat Aripin, 2014).
- High percentage of delay for non-critical Green Zone patients in receiving analgesia after doctor's consultation.
- Long waiting times for surgical patients in the semi-critical Yellow Zone to be reviewed by the inpatient surgical team.
- Medical patients stranded in the ED waiting for an open ward bed for more than 4 hours.
- Lack of regular Endotracheal Tube (ETT) cuff pressure monitoring for intubated cases boarded in the ED.
- High percentage of undertriage, where Red Zone cases are mistakenly sent to the Green Zone.
- Inefficiencies in diverting stable referrals from local Klinik Kesihatan straight to primary teams to bypass and decongest the ED.

To narrow down the focus, the author applied the Nominal Group Technique (NGT) scoring method based on standard SMART criteria (Specific, Measurable, Achievable, Relevant, Time-bound). A weightage scale of 1 (Low), 2 (Medium), and 3 (High) was used to grade each issue, with scores compiled out of a maximum of 75 points (Moreyra *et al.*, 2024). A delphi consensus among 5-6 experts in the field of practice were used to do the NGT.

**Table 1: Problem Prioritization via Nominal Group Technique**

| No. | Problem Statement                                                                            | S         | M         | A         | R         | T         | Total Score |
|-----|----------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-------------|
| 1   | Green zone waiting hour more than 90 minutes                                                 | 7         | 15        | 15        | 13        | 15        | 65          |
| 2   | <b>Delay in receiving analgesia after consultation in non-critical patient in green zone</b> | <b>11</b> | <b>14</b> | <b>14</b> | <b>15</b> | <b>15</b> | <b>69</b>   |
| 3   | Long waiting time for surgical patient to be reviewed by surgical team in yellow zone        | 9         | 9         | 12        | 10        | 15        | 55          |
| 4   | Bed waiting time for medical patient to be admitted more than 4 hours                        | 13        | 15        | 14        | 11        | 9         | 62          |
| 5   | Lack of ETT cuff pressure monitoring in intubated patient in ED                              | 13        | 5         | 13        | 13        | 15        | 59          |
| 6   | High percentage of undertriage of redzone patient to green zone                              | 10        | 13        | 15        | 5         | 15        | 58          |
| 7   | Referral stable patient from health clinic to primary team (ED decongestion)                 | 8         | 6         | 11        | 10        | 14        | 49          |

Note: S-Specific; M-Measurable; A-Achievable; R-Relevant; T-Time-bound

Table 1 analyzes the NGT scoring identified delayed analgesia after consultation among Green Zone patients as the highest-priority problem, achieving the maximum score of 69/75. This indicates that improving timely pain management was considered the most relevant and achievable intervention area compared with other operational issues.

Problem 2 came out on top with the highest score of 69, making it the final target for this proposed method. The study title was locked in as: Improving percentage of green zone patients with acute trauma related pain receiving analgesia within 90 minutes.

### Study Criteria and Quality Metrics

The target scope is focused exactly on acute trauma cases using strict entry filters:

**Inclusion Criteria:** Green Zone patients presenting with acute trauma-related pain.

**Exclusion Criteria:** Green Zone patients with preexisting or chronic pain issues (e.g., old back pain, cancer pain, chronic arthritis).

To check if the changes are working, the framework tracks progress using this standard Quality Assurance (QA) indicator formula

Quality Assurance Indicator (%) = (Number of events meeting the standard criteria / Total population or total number of opportunities) x 100

According to the Ministry of Health Malaysia (2020), the standard target that needs to be hit is  $\geq 70\%$  compliance.

## Results

### Root Cause Bottlenecks

The author mapped out the underlying departmental issues using a Problem Analysis Chart to figure out why the delays keep happening. The main problems attributed primarily to:

*Fragmented Department Layout:* The consultation rooms, treatment rooms, and medication counters are located far apart. Staff have to walk back and forth expedite operational throughput

*Medication Inaccessibility:* Pain medications are not stored inside the physical Green Zone footprint. Nurses have to go all the way to the central ED pharmacy or main storage to indent and collect them.

*Lengthy, Rigid Workflow:* The sequential pathway is too long (Primary Triage → Registration → Secondary Triage → Consultation Room → Treatment Room). It leaves no room for parallel processing.

*Frontline Staff Gaps:* Triage Medical Assistances are often not confident enough to initiate alternative pain relief options on their own, usually relying only on standard Paracetamol (PCM) (Zelege *et al.*, 2021). There are also gaps in baseline pain scoring and a general shortage of staff on shift.

*Patient Factors:* A heavy influx of patients causing severe overcrowding, combined with demanding patient behaviors or low pain thresholds.

**Table 2: Operational Analysis and Root Cause Bottlenecks**

| Category (Bone)                                          | Sub-Causes / Contributing Factors                                                                                                         | Impact on the Final Problem                                                                                                |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Patient Related                                          | <ul style="list-style-type: none"> <li>• Overcrowding</li> <li>• Demanding behavior</li> </ul>                                            | Increases overall volume and environmental noise, making it harder to spot and treat high-priority pain cases quickly.     |
| Improper Triage                                          | <ul style="list-style-type: none"> <li>• Poor staff knowledge</li> <li>• Inadequate pain scoring</li> </ul>                               | Leads to underestimating patient pain levels at entry, preventing immediate escalation or tracking.                        |
| Workflow Issues                                          | <ul style="list-style-type: none"> <li>• Lengthy sequential flow</li> <li>• Separate medication counters</li> </ul>                       | Creates artificial physical bottlenecks where patients must wait in multiple lines just to receive ordered drugs.          |
| Delayed Non-Pharmacological / Pharmacological Initiation | <ul style="list-style-type: none"> <li>• Frontline staff shortage</li> <li>• Triager hesitant to give beyond PCM (Paracetamol)</li> </ul> | Limits available hands for immediate non-drug care and delays clinical management due to overly restrictive triage limits. |
| Final Problem                                            | <b>Low % Analgesia &lt; 90 Minutes</b>                                                                                                    | The cumulative result of clinical skill gaps, communication barriers, and physical process bottlenecks.                    |

Table 2 explains the root cause analysis demonstrates that delayed analgesia is influenced by multiple interconnected factors, including workflow inefficiencies, medication accessibility issues, staff-related limitations, and patient volume pressures. These findings highlight that improving pain management requires a systematic redesign of the existing emergency department workflow rather than addressing a single isolated factor.

### Model of Good Care (MOGC) Blueprint

To overhaul this slow workflow, the author proposes a concrete Model of Good Care.

Standardized protocols from previous studies have shown reduction in time to analgesia (Kanani *et al.*, 2025), nurse initiated analgesia also showed improved time to pain intervention (Burgess *et al.*, 2025), and standardized fracture care leads to higher patient satisfaction (Heilman *et al.*, 2016)

This puts a 100% mandatory compliance target on every staff member handling the patient at three key areas:

**Table 3: Model of Good Care (MOGC) Blueprint**

| No | Process           | Personnel Involved                | Criteria                                                                                                                                                                      | Standard                     |
|----|-------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
| 1. | Secondary triage  | Medical assistant                 | Assessment of pain score<br>Documentation of pain score<br>Initiation of pain treatment – pharmacological<br>Initiation of pain treatment – non pharmacological               | 100%<br>100%<br>100%<br>100% |
| 2. | Consultation room | Doctor                            | Reassessment of pain score<br>Prescribed appropriate analgesia by treating doctor<br>Document and indent the medications in the system                                        | 100%<br>100%<br>100%         |
|    |                   | Doctor<br>Nurse/Medical assistant | Communicate with the staff in treatment room                                                                                                                                  | 100%                         |
| 3. | Treatment room    | Nurse/medical assistant           | Ensure the 7 rights, principles and protocols before serving the medications<br>To implement non pharmacological treatment<br>Charting after medications served in the system | 100%<br>100%<br>100%         |

The Table 3 proposed MOGC establishes standardized responsibilities for medical assistants, doctors, and nurses at different stages of patient care, with a target of 100% compliance for key pain management processes. This structured approach aims to minimize delays by promoting early assessment, timely intervention, accurate documentation, and coordinated teamwork.

#### **Proposed Data Collection Strategy**

To audit the numbers accurately, a rapid data collection window running through August 2026 is structured into the model:

- **Hard QA Indicator Data:** A designated data collector pulls the raw numbers (numerator and denominator) straight from EHR logs.
- **Workflow Analytics:** The model tracks specific timestamps (Registration-to-Consultation and Registration-to-Analgesia) via the EHR system. Alongside this, short, structured questionnaires are distributed to the MAs and nurses on duty to gauge their familiarity with the upgraded pain management protocols.

#### **Discussion**

To accommodate an intensive, rapid-cycle improvement methodology, the lifecycle of this initiative is compressed into a 2-month timeline spanning July 2026 to August 2026:

**Table 4: Project Timeline: Medication Error Intervention Study**

| Activity / Phase                          | July 2026  | August 2026 |
|-------------------------------------------|------------|-------------|
| Study Proposal & Approvals                | ■■■■■■■■■■ |             |
| Briefing, Staff Training & Pre-Survey     | ■■■■■■■■■■ |             |
| Remedial Measures Deployment (Zone Carts) | ■■■■■■■■■■ |             |
| Active Data Collection & EHR Audits       |            | ■■■■■■■■■■  |
| Post-Intervention Data Analysis           |            | ■■■■■■■■■■  |
| Preparation, Submission & Dashboard Setup |            | ■■■■■■■■■■  |

Table 4 explains the two-month implementation timeline outlines a phased approach involving preparation, staff training, deployment of analgesia carts, EHR-based data collection, and post-intervention evaluation. This rapid-cycle improvement strategy provides a practical framework for monitoring workflow changes and assessing their impact on analgesia delivery within the targeted 90-minute timeframe.

*July 2026 (Phase I - Setup & Deployment):* The initial weeks focus on finalizing approvals for the study proposal, running briefing sessions, and distributing staff pre-questionnaires. By mid-month, remedial measures are actively deployed including setting up the decentralized "Analgesia Carts" inside the Green Zone and training triage MAs to execute parallel checks.

*August 2026 (Phase II - Audit & Reporting):* Focus completely shifts to active EHR data collection and timestamp tracking to pull the hard QA indicators. The closing weeks are dedicated to post-intervention data analysis, drafting and submitting the final report to hospital management, and locking in automated dashboard monitoring to prevent process drift.

Ultimately, this short communication demonstrates that substantial financial resources are not a prerequisite for meaningful optimization. —minor, smart changes to the floor layout can drastically cut down waiting times. The author's proposed method of setting up a dedicated "Analgesia Cart" right inside the Green Zone means nurses no longer need to waste time running to the main pharmacy counter. Pairing this with a simple checklist gives our triage MAs the confidence to start early pain relief without waiting for a doctor's full consultation. Hitting the 70% compliance standard is highly achievable, and it will go a long way in shortening total waiting times and providing better, more compassionate care to our public hospital patients. Medical officers must use their clinical judgment when applying this suggested workflow model to suit their individual hospital constraints, staffing levels, and patient safety requirements.

### **Limitations**

The operational guidelines, workflows, formulas, and implementation timelines detailed in this short communication are intended for hospital quality improvement planning and general educational purposes within healthcare administration. They do not constitute formal clinical advice, official diagnostic steps, or personalized medical treatment for individual cases. Clinicians must maintain independent clinical judgment and adapt these suggestions according to local hospital resources, patient contraindications, and individual safety protocols.

### **Future Scope**

Future studies can explore the long-term sustainability of timely analgesia protocols across multiple emergency departments and weigh up their impact on patient outcomes, satisfaction, and healthcare efficiency. Further research may also assess the role of multidisciplinary interventions and digital tools in improving pain management practices.

### **Conclusion**

This proposed Quality Improvement (QI) initiative offers a practical and highly structured framework to tackle institutional oligoanalgesia within the perennially congested Green Zone of our public Emergency Departments. By shifting away from traditional, rigid linear processing and directly addressing layout fragmentation—specifically through the deployment of decentralized analgesia sub-stores and dedicated medication carts—this model bridges the gap between national clinical guidelines and the harsh realities of frontline public healthcare delivery. Furthermore, addressing staff gaps by empowering our triage Medical Assistants (MAs) and nursing staff through targeted briefings ensures that acute trauma pain is managed proactively rather than as an afterthought.

Aligning closely with the International Association for the Study of Pain in 2020 and national pain management guidelines, this rapid implementation workflow provides a sustainable and scalable blueprint for other Ministry of Health hospitals nationwide facing similar overcrowding dilemmas. Moving forward, the long-term success of this framework will rely heavily on consistent EHR data extraction and continuous feedback loops with frontline staff to ensure the workflow remains practical on the ground. Ultimately, re-engineering these workflow pathways does more than just help our departments hit the national KKM QA benchmark of 70% compliance within the 90-minute window; it elevates our baseline standard of emergency care, ensuring that non-critical trauma patients receive timely, effective, and compassionate pain relief when they need it most.

### CRediT Authorship Contribution Statement

**G.S.H.S.:** Conceptualization, methodology, analysis, drafting; Literature search, data extraction, and validation.

### AI Assistance Declaration

The author hereby declares that, during the preparation of this manuscript, generative AI tools such as ChatGPT, Microsoft Copilot, and Google Gemini were utilized to assist with language enhancement and grammar correction. Following the use of these tools, the author thoroughly reviewed and revised the content and takes full responsibility for the final version of the manuscript, ensuring its accuracy and adherence to the required academic standards.

### Conflict of Interest

The author declares that they have no conflicts of interest.

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