

Understanding Workflow Nuances That Affect the Use of a Laboratory Test Ordering Support Tool

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Abstract. The “Emergency Department Pathology Order Support Tool” (ED-POST) is an electronic laboratory test ordering decision support tool that aims to decrease variation in test ordering practices. As part of a larger project on the co-design, development, and evaluation of ED-POST, this study aimed to explore the workflow nuances that might affect the intended use of the digital decision support tool. Semi-structured, in-depth interviews were conducted with 15 ED clinicians involved in the laboratory test ordering process across the development and evaluation phases of ED-POST. Participants identified the expanded role of registered nurses in test ordering and the practice of ordering tests that are outside the ED’s scope as contextual characteristics that can affect the use and perceived utility of the proposed ED-POST tool. Reconciling “work-as-imagined” with “work-as-done” in the design and development of electronic interventions is important in achieving interventions to improve the safe and effective use of pathology tests.

Keywords. emergency department, laboratory test ordering, decision support, contextual factors, qualitative studies, pathology

1. Introduction

Laboratory tests facilitate patient care by identifying and monitoring disease and supporting clinical decision making along the healthcare trajectory [1]. However, there is evidence of variation in laboratory test ordering, particularly in acute-care settings such as hospital Emergency Departments (EDs) and Intensive Care Units (ICUs) [2, 3], potentially leading to missed diagnoses [4] or a cascade of added investigations resulting

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in potential risk to patients [5]. The “Emergency Department Pathology Order Support Tool” (ED-POST) is a digital health support tool collaboratively co-designed between clinicians, pathology directors and management, data scientists, and health services researchers to facilitate appropriate, safe, and effective use of pathology. Its inception follows a number of state and national initiatives, which aimed to decrease variation in test ordering practices but relied on manual processes that were difficult to sustain [6, 7].

As part of a larger project on the design, development, and evaluation of ED-POST, this paper reports the workflow nuances that might affect the intended use of the tool to reconcile ‘work-as-imagined’ and ‘work-as-done’ [8] to optimise uptake and outcomes of implementation.

2. Methods

2.1. Design and Setting

A qualitative exploratory approach [9] was adopted as a way of understanding pathology test ordering and decision-making workflows. In-depth interviews and an observation of the triage area were conducted across two project phases in the ED of a major regional teaching hospital intended to be the pilot site for the intervention.

2.2. Data Collection and Analysis

Data collection took place over two phases. Prior to the development of ED-POST (Phase 1), semi-structured interviews were conducted with key informants (n=4) to understand the pathology test ordering and decision-making workflow and requirements. Interviews took place in April 2023 (range: 16min 45sec–1hr 2min 33sec), with participants selected based on their involvement and familiarity with the laboratory test ordering process to inform the development of the test ordering support tool. Interviews were supplemented with an observation session (approx. 30min) of the emergency department triage area where most test ordering occurred. Observational field notes, non-identifiable photographs of relevant artefacts, and documentation (e.g., guideline documents, unfilled laboratory test order forms) were also collected to provide further context.

Following the development of an initial ED-POST prototype, individual demonstrations of the tool were delivered onsite in October 2023 to a larger sample of frontline clinicians (n=11) selected purposively based on their involvement in the laboratory test ordering process (Phase 2). Immediately post-demonstration, participants were interviewed (range: 4min 21sec–13min 23sec) and asked to describe the perceived usability, utility, and impact of the tool on decision-making and workflow, as well as suggestions for improvement. The demographics of participants across both phases are presented in Table 1 below.

Interviews and observations from both phases of the study were audio recorded and transcribed for inductive analysis using a thematic grounded theory approach [10]. One researcher (JL) performed the analysis, and the results were reviewed by a key informant from the site. As part of a larger project on the development and evaluation of ED-POST, workflow nuances that emerged from the analysis as factors that might affect the intended use of the tool are presented here.

Ethics approval for the project was granted by the Human Research Ethics Committee of the relevant Local Health District (2022/ ETH01809).

Table 1. Participant demographics.

ID	Role	Gender	Age
NA1	Advanced Practice Nurse	F	25-34
DA1	Staff Specialist	M	55-64
DB1	Staff Specialist	F	35-44
DC1	Registrar	F	25-34
DD1	Registrar	M	35-44
NB1	Registered Nurse	F	35-44
DE1	Intern	M	25-34
DF1	Registrar	F	25-34
DG1	Senior Resident Medical Officer	M	25-34
NC1	Registered Nurse	F	25-34
DH1	Staff Specialist	M	35-44
DII	Staff Specialist	F	35-44
DJ1	Registrar	F	25-34
DK1	Registrar	F	35-44
ND1	Advanced Practice Nurse	F	35-44

2.3. Intervention (ED-POST)

ED-POST was developed using the Pathology Atlas of Variation (Atlas) data source, which contains over 8 million encounters and 25 million tests across four years in 35 facilities [11, 12]. The Atlas analytical model merges ED data such as presenting problems, patient demographics, and triage categories with test ordering profiles. It also measures ED throughput and pathology turnaround times to identify intervals around patient arrival in the ED to triage, arrival to pathology order, the overall length of stay, and mode of separation. This information can be used to create probability scores from 0–100% for tests being ordered for scenarios with known variables at the time of triage (presenting problem, triage category, age, sex, and facility).

ED-POST utilises patient triage variables and calculates the probability of the top 11 most commonly ordered laboratory tests (e.g., CRP, LFT, EUC, etc.) in the ED being ordered based on patients of an identical presenting profile from its entire dataset of 8 million encounters. The tool then displays ordering trends for their hospital compared with the state average to support test ordering decision making.

3. Results

Participants identified workflow nuances that might affect the use and perceived utility of the ED-POST tool: the expanded role of registered nurses and the ordering of diagnostic tests for inpatient teams.

3.1. Expanded Role of Registered Nurses

To address significant delays in obtaining pathology results that impact patient length of stay (and corresponding delays to diagnosis and treatment), senior registered nurses practised an expanded role at triage to expedite patient throughput. Triage nurses performed protocolised test ordering within the scope of a locally-developed guideline and performed venepuncture, initiated basic treatments, and escalated abnormal results (e.g., blood gases).

“one of the things about ED that makes us different to a lot of other services anywhere in [NSW] Health is our nurses have a lot of autonomy over what they do. So our senior nurses have all done advanced packages so that they're able to order x-rays, they can order bloods, and they can initiate analgesia and antiemetics and things like that. Mostly because they're the only ones that see the patients when they first arrive sometimes for a couple of hours. We don't have the real estate in this department. We've got an incredibly small footprint for the amount of people that we see every day. We've got the highest turnover through beds of any hospital in the state.” Advanced Practice Nurse NA1

As a result, many preliminary tasks were completed upon patient arrival in the department.

“because of the workflows we have here [...], by the time a patient comes into the bed spaces that are around us, they've often had analgesia, bloods, and ECG, maybe a chest x-ray [...]. And that's all initiated by the nurses out at the front.” Advanced Practice Nurse NA1

“a lot of the time the nurses will initiate the bloods before I've seen the patient” Registrar DC1

Physicians also expressed that it was not uncommon for test results to have already returned by the time they saw the patient.

“the majority of our patients [...] have a blood drawn and a test ordered in the first hour, probably, of their presentation to ED. [...] The majority of the time the tests are at least taken and either on their way to the lab or in the lab are frequently available by the time the clinician sees the patient.” Staff Specialist DA1

3.2. Ordering for Inpatient Teams

Junior doctors reported deviations in the ordering of tests relevant to the patient's emergent care, either under instruction from inpatient teams or in anticipation of their eventual request.

“I think a lot of the time specifically for my role in the emergency department, we're often guided by other specialit[ies] as well. So, for example, commonly what will happen is I'll see a patient and order an FBC and a UEC. I may not order the CRP, but then we call the medical team and they'll ask for a CRP.” Senior Resident Medical Officer DG1

Without formal resources, one junior doctor maintained a personal list of commonly requested tests from other specialties for reference.

“At the moment I have a list of what I know gastro likes ordered and so I just pull that up.” Intern DE1

4. Discussion

Participants identified the expanded role of registered nurses and the ordering of diagnostic tests for inpatient teams as workflow nuances that might affect the use and perceived utility of the ED-POST tool. To address significant delays in obtaining pathology results that impact on patient length of stay, a locally-developed protocol was implemented at the study site to increase the advanced practice capacity of the existing ED workforce. As a result, the vast majority of laboratory test ordering was conducted at the commencement of the patient encounter at triage to facilitate result availability and clinical decision making at an earlier stage of patient care. This holds implications for the use and perceived applicability of ED-POST by different staff groups at the site as it represents a shift in ordering workload away from autonomous practitioners such as physicians to registered nurses whose role in test ordering has traditionally been limited. The perceived utility of a laboratory test ordering support tool by physicians who receive patients at a later stage of the ED trajectory might also be diminished as their decision making around potential further laboratory testing would likely be based on the returned results of tests already requested at triage.

The practice of ordering tests that are typically out of scope for the ED speaks to the department's role in the coordination of the patient journey within and beyond the hospital [13]. Existing evidence indicates that ordering behaviour in the ED can be shaped by local and systemic factors, including requirements of admission, conflicting guidelines, and availability of in-house diagnostic services [14]. Digital health interventions could consider integrating this variation as a necessary element of the test ordering decision making process in the ED.

The interaction between the intervention and conditions of the broader clinical setting can influence the organisational response, use, and outcomes of a digital health intervention [15]. Utilising a qualitative exploratory approach to understanding “work-as-done” [8] facilitates the identification of contextual mechanisms within the clinical environment that can influence implementation outcomes and account for differences across sites [16].

5. Conclusions

Understanding site-specific nuances in workflow allows the identification of contextual mechanisms that can account for the uptake and impact of digital health implementation. Reconciling “work-as-imagined” with “work-as-done” in the design and development of electronic interventions is important in the delivery of tangible outcomes in quality and safety.

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