Implementation of a Qualitative Serum Pregnancy Test to Address Gender Disparities in the ED

Category of submission (select as many as apply):

Reducing Disparities

IOM Domains that this project addresses (select as many as apply)

Safety
Patient Centered
Equitable

Please share how you defined your project. Consider addressing the questions below. (Max 500 Words)
What was the identified Quality Gap? - What was the improvement target? - What was the timeline of the project? - Who were the stakeholders? - What was the stakeholders' input? - What was the method for collecting stakeholder input? - What was the potential for significant impact to the institution? - What was the potential for significant impact to society?

The initial impetus for this quality improvement project was based on anecdotal observations that there were delays in CT imaging for women of childbearing age (WCBA) in our Emergency Department (ED). An initial retrospective chart review comparing CT turn-around-time (TAT) and ED length-of-stay (LOS) in WCBA and similarly matched men was performed. This study demonstrated significantly longer CT TAT and ED LOS in WCBA compared to similarly aged men. A regression analysis showed a correlation between time to pregnancy screening result and CT TAT (Figure 1). Therefore, it was hypothesized that the gender disparities in CT TAT and ED LOS delays were, at least in part, related to necessary pregnancy testing for WCBA. We performed an initial quality improvement project (from March 2018 to January 2019) aimed at improving CT TAT and ED LOS through implementation of a standardized qualitative urine pregnancy screening process in ED triage. The process did not yield clinically significant results and was not deemed sustainable due to ED staffing issues.

We then gained institutional approval to implement a serum qualitative hcg test. We hypothesized that use of this test would decrease delays associated with pregnancy screening, as it could be sent alongside other serum tests that are often necessary prior to CT imaging (such as creatinine level). The estimated result time, per laboratory leadership, was similar to (if not shorter than) other serum

labs (such as creatinine level). Timeline for go-live of the new serum qualitative test was March 2020, after which data was gathered.

Stakeholders for this process included ED physicians, nurses, assistants, and radiology technicians, as well as staff and leadership from the laboratory, ED, and hospital operations. The problem and proposed intervention were explained to each of these stakeholders. Stakeholder input and feedback were applied to the process prior to implementation. For instance, laboratory leadership expressed concern about rapid implementation and quality control prior to defining a streamlined process in the laboratory; for this reason, the process was implemented on existing samples in the laboratory prior to roll-out for official use by ED staff. Additional stakeholders included patients and their advocates. Though this process involved minimal change for patients, patients were informed of testing at time of blood draw.

There was strong potential for significant impact to the institution and society in addressing the documented gender disparities in our ED. For the institution, there were potential implications for cost-savings, as the new test was less expensive than the prior urine screening test. Additionally, there is resource- and cost-savings associated with preventing delays in care and length-of-stay. Lastly, there was also strong potential for significant impact on society by providing more equitable and safer care in addition to reducing delays and length-of-stay.

Please describe how you measured the problem. Consider addressing the questions below. (Max 500 Words)
What data sources were used? - Was a numeric baseline OUTCOME measure obtained? - What defined the sample size? - What counterbalance measures were identified? - What numeric baseline COUNTERBALANCES were obtained? - Was the outcome measure clinically relevant? - Was the outcome measure a nationally recognized measure?

Data were obtained from the institution's Enterprise Data Warehouse. Specifically, the institution is a large, urban, academic Level 1 Trauma Center that delivers care to over 100,000 primarily adult patients annually in its ED. Measures that were clinically relevant and/or a nationally recognized measure were used. Primary outcome measures included CT turn-around-time, defined as time from CT order to CT acquisition, and ED length of stay, defined as time from ED arrival to departure, and the difference between women of childbearing age and similarly aged men for each of these measures. The secondary outcome measure was the percentage of women of childbearing age with pregnancy screening performed in the ED. Baseline data were collected from March 2018 to January 2019. All patients aged 12-50 years who underwent CT chest and/or abdomen/pelvis were included in the

primary aim analysis, as women within this age range are required to have a negative pregnancy test prior to these scans unless exemption criteria are met. Patients were excluded if deemed Left Without Being Seen or ED Dismissed-Never Arrived, if CT order was placed after CT completion or after the patient departed the ED, or if the CT was completed after the patient departed the ED. In addition, a second population consisting of all women aged 12-50 presenting to the ED was used for secondary aim analysis of overall pregnancy screening rates. The project was deemed non-human subjects research by the Institutional Review Board.

A total of 5215 patients were included in the analysis of baseline data. Baseline data, as discussed above, showed statistically significant gender disparities in CT TAT and ED LOS. CT turn-around-time for women of childbearing age was 19 minutes longer than for similarly aged men ($p<0.001$). ED length of stay was 27 minutes longer for women of childbearing age compared to similarly aged men at baseline ($p=0.01$). Baseline pregnancy testing rate was 51.3%, showing significant opportunity for improvement. In total, this baseline data showed there is gender disparity in CT turn-around-time and ED LOS in our ED, highlighting an important area for improvement to promote equitable care.

Please describe how you analyzed the problem. Consider addressing the questions below. (Max 500 Words)
What was one factor contributing to the gap? - Were multiple factors contributing to the gap? - Was a structured root cause analysis undertaken? - What was the appropriate QI method or tool used for root cause analysis? - Was a root cause analysis performed prior to identifying potential solutions? - What was the rationale for selecting intervention(s)? - Did the project use a QI method or tool for selecting intervention(s)?

Pre-intervention data demonstrate statistically significant gender disparities in CT turn-around-time and ED length of stay. We suspected that these disparities were related to delays in pregnancy testing, as this is the only additional requirement prior to CT imaging for women of childbearing age compared to similarly aged men. Additionally, we performed a regression analysis of time to pregnancy screening test result (defined on the X-axis as “Arrival to First HCG Result (min), or the time from patient arrival time to the first hcg result) vs CT TAT. This showed a correlation between time to pregnancy screening result and CT TAT (Figure 1). Therefore, it was hypothesized that the gender disparities in CT TAT and ED LOS delays were, at least in part, related to necessary pregnancy testing for WCBA. We also considered that delays in CT turn-around-time for women of childbearing age were due to concurrent pelvic exams or simultaneous pelvic ultrasound testing. However, it is the culture of our ED to complete the full physical exam before ordering an imaging study and to order one imaging study at a time, so it is unlikely that a CT imaging would be delayed due to an ongoing pelvic exam or ultrasound study. Creatinine result time, defined as time from creatinine order placement to result,

was analyzed as a potential confounder, as this is the only other test result required before CTs with intravenous contrast. Creatinine result time was not significantly different between groups. It is also possible, however, that additional factors that we did not or were not able to measure, such as gender biases, contribute to the gender disparities we found. We also performed an initial quality improvement project (February to July 2019) aimed at improving CT TAT and ED LOS through implementation of a standardized qualitative urine hcg pregnancy screening process in ED triage. The process did not yield clinically significant improvements in primary and secondary outcomes and was not deemed sustainable due to ED staffing issues.

Given the above, we chose to implement a serum qualitative hcg test for departmental pregnancy screening. We hypothesized that this more rapid test, which relies only on nursing staff drawing blood and not on the patient to provide a urine sample, would reduce any delays associated with pregnancy screening. The anticipated turn-around-time for this test, per laboratory leadership, was similar to or shorter than other serum tests that are often drawn prior to CT imaging (such as creatinine level). We anticipated that this process would be sustainable, as it is not dependent on specific ED staffing outside of normal triage and evaluation. For instance, the process does not increase workload for nursing staff and actually lightens the workload for ED assistants, as it completely removes them from the pregnancy screening process.

Please describe how you improved the problem. Consider addressing the questions below. (Max 500 Words)
What was the implementation of intervention(s) (date/time of go live)? - Was the target measure re-measured afterwards with comparison graph? - Was a structured plan for managing change used? - Was the project counterbalance re-measured with a comparison graph? - Was the counterbalance adversely affected? - Is the improvement in target outcome measure shown? - Was a statistical significance demonstrated in the outcome measure?

The serum qualitative hcg test was implemented in the ED in March 2020. This “go-live” date occurred after a period of process implementation in the institution’s laboratory with iterative periods of process improvement until quality assurance and control were ensured in the laboratory process. The primary and secondary outcomes were measured in total for the period and displayed in run charts for better understanding of the process improvement over time. Post-intervention data were gathered from March 25, 2020 to July 31, 2020 and compared to the baseline data presented above (specifically, March 3, 2018 to January 29, 2019). We are in the process of obtaining additional data beyond this initial, four-month period of the intervention.

A total of 5215 and 1644 patients were included pre- and post-intervention, respectively. CT TAT for WCBA significantly decreased by 6 minutes post-intervention ($p < 0.05$). Disparity in CT TAT decreased post-intervention for WCBA compared to similarly aged men (19 min pre-intervention vs 17 minutes post-intervention). A run chart of this data by month is shown in Figure 2. ED LOS for WCBA significantly decreased by 59.3 min post-intervention ($p < 0.05$). ED LOS disparity did not improve post-intervention for WCBA compared to similarly aged men (27 min pre-intervention vs 52.6 min longer post-intervention). However, when considering the run chart of disparity in ED LOS as shown in Figure 3, an astronomical point in the pre-intervention data may have skewed the pre-intervention disparity data in a negative direction (Figure 3). Pregnancy testing rate significantly improved from 51.3% to 62.9% ($p < 0.01$).

Please describe the control phase of your project. Consider addressing the questions below. What were the lessons learned from the project? - Was there communication to stakeholders of the summary of the project, and lessons learned? - Was a process owner identified? - Did the process owner acknowledge ownership of ongoing monitoring? - What control measures were identified? - What was the reaction plan for deficiencies identified in the control measure? - Was there at least one year of sustained monitoring demonstrated? - Was the project successfully diffused in scholarly form (i.e. poster, manuscript, etc)?

We are actively working on obtaining additional data for sustained monitoring. Once this data is obtained, it will be plotted on a run chart to establish additional trends over time. Dana Loke, MD who served as team lead for this quality improvement project, will also serve as process owner and is actively working on ongoing monitoring. Working through this quality improvement initiative, especially through the COVID-19 pandemic, has revealed many lessons for both this ongoing work and quality improvement and change management in general. Perhaps the most important lesson, and what helped us propel our quality improvement project forward, was the importance of knowing your stakeholders and their value propositions. As discussed, many stakeholders were involved in this process though each had different value propositions, potential benefits to be gained from the project, and potential concerns regarding implementation. For instance, nursing staff initially expressed concerns regarding workload and cost-effectiveness. While laboratory leadership also initially expressed concerns about cost-effectiveness, they also raised thoughts about the implications for use of this test outside of the ED (for instance, for pregnancy screening prior to outpatient imaging). We were able to consider our stakeholders and their value propositions prior to engagement with each stakeholder and therefore were able to gain buy-in from all stakeholders early on. In addition, we cannot stress enough our lessons learned regarding intervention sustainability from our prior quality improvement initiative focused on implementing a standardized urine pregnancy screening process in triage. By considering sustainability from the very beginning of the serum qualitative test as our next intervention, we were better able to ensure project success.

This quality improvement project has currently been accepted as a poster presentation and will be presented at the 2022 Society for Academic Emergency Medicine Academic Assembly on May 13, 2022. Baseline data was previously presented at the 2019 Society for Academic Emergency Medicine Academic Assembly on May 17, 2019. Baseline data and the prior intervention involving implementation of a standardized urine pregnancy screening process in triage were previously published in the Canadian Journal of Emergency Medicine in January 2022 (Loke DE, Farcas AM, Ko

JS, Aluce LM, McDonald VR, Shakeri N, Fant AL. Implementation of a standardized pregnancy screening process to address gender disparities in radiology turn-around-time and ED length of stay. CJEM. 2022 Mar;24(2):206-213. doi: 10.1007/s43678-021-00227-3. Epub 2022 Jan 11. PMID: 35018621.). The study team has no disclosures.

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Attachments

Arrival to First HCG Result vs Arrival to CT End