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# Simple signature/countersignature shared-accountability quality improvement initiative to improve reliability of blood sample collection: an essential clinical task

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## ABSTRACT

**Background** Timely lab results are important to clinical decision-making and hospital flow. However, at our institution, unreliable blood sample collection for patients with central venous access jeopardised this outcome and created staff dissatisfaction.

**Methods** A multidisciplinary team of nurses including a specialist clinical nurse leader (CNL), the hospital intravenous team and quality improvement (QI) consultants aimed to achieve >80% blood sample collection reliability among patients with central venous access by employing a simple signature/countersignature form coupled with audit-feedback and behavioural economics strategies. The form was piloted on one 25-bed unit. Data were collected for 60 weeks and interpreted per standard run chart rules.

**Results** Blood sample collection reliability exceeded the 80% goal by week 22. The practice was sustained on the pilot unit and spread successfully to other wards despite significant operational threats including the COVID-19 pandemic.

**Conclusions** At our institution, a simple signature/countersignature form supplemented by audit-feedback and behavioural economics strategies led to sustained practice change among staff. The pairing of CNL to QI consultant enhanced change potency and durability.

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Lab tests are used to drive clinical decision-making, and specimen collection is a necessary early step supporting this essential healthcare function.
⇒ Routine and transparent display of performance data to internal stakeholders is a hallmark of mature high-reliability healthcare organisations according to The Joint Commission.
⇒ Behavioural economics strategies have shown promise in nudging clinical staff to adopt desired practices.
⇒ COVID-19 pandemic has stressed hospitals and clinics worldwide and imperilled the start and sustainment of countless improvement projects.

### WHAT THIS STUDY ADDS

⇒ This report introduces a low-cost, minimally disruptive intervention that permits rapid capture and transparent display of performance data, applies behavioural economics principles to immediately correct practice deviations, and buttresses improvement efforts against interruption and premature discontinuation.
⇒ This report also presents one example of how hospitals can operationalise the novel clinical nurse leader role for quality improvement.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This report offers a model for quickly establishing performance measurement of critical healthcare functions while simultaneously introducing corrective nudges in a manner respecting Just Culture.
⇒ This model is particularly well suited to healthcare settings constrained by limited resources or operational instability.

## INTRODUCTION

Hospital care regularly hinges on the timely return of laboratory data to guide therapeutic decisions and determine patient disposition. In addition, lab turnaround time has previously been linked to staff satisfaction[1–3] and is presumed, logically, to influence care quality.[4] At our institution, nursing staff became concerned by the frequency of missed blood draws among patients with central venous access. In response, a quality improvement (QI) project was initiated seeking to (1) establish formal measurement of the blood sample (hereafter, 'sample') collection rate, given this is the first crucial step in the lab turnaround chain, (2) apply audit-feedback and behavioural economics principles to correct staff practices in a manner upholding Just Culture[5] and (3) minimise workflow disruption and maximise sustainability. The improvement team hypothesised that a single-item shared-accountability form

incorporating a signature/countersignature mechanism would allow quantification of baseline performance and, by visibly feeding this performance back to employees, nudge workplace habits toward a prespecified goal. We further hypothesised that the simplicity of this intervention would enhance its durability in the face of present and future operational constraints. This report describes the outcome of those efforts.

## METHODS

At our institution, sample collection for patients with central venous access requires, first, an electronic lab order entered by the provider, then receipt of that order by the bedside nurse who places specimen tubes and labels in a designated area and, lastly, retrieval of those supplies and performance of the blood draw by the intravenous team. Conversely, for patients without central venous access who undergo percutaneous phlebotomy, the provider order is transmitted directly to the laboratory, whose phlebotomists label, collect and transport the samples without involvement of the bedside nurse or intravenous team.

Oncology patients, who often have central venous access, are preferentially admitted to one 25-bed unit at our facility; this unit was selected to be the pilot site. The multidisciplinary QI team consisted of senior nurses on the pilot unit, including one clinical nurse leader (CNL) dedicated to training and coordinating systems-level functions with bedside care,[6] representatives of the hospital intravenous team and QI consultants (one physician and one nurse) knowledgeable in plan–do–study–act (PDSA) methods. Concerns about sample collection reliability raised by front-line nurses were treated as a form of voluntary safety reporting, and this project was conceived in response under the additional premise of a small-scale employee engagement activity meant to encourage staff self-reliance in tackling adjacent problems.

The QI team elected to test a single-item shared-accountability form (first intervention) which required the bedside nurse to sign when depositing supplies in the designated area and the intravenous team to countersign after completing the blood draw. The paper form was pinned to a clipboard kept in the designated area. The pilot unit CNL and charge nurse regularly copied entries from the paper form into a digital spreadsheet (Excel, Microsoft Corp). These data were then converted into graphs by the QI consultants and prominently posted next to the signature clipboard to provide staff with running feedback of their performance each month (second intervention). The CNL further summarised the data verbally for frontline staff and encouraged protocol adherence. Given that signature and countersignature were the only steps added to established workflow, the intervention was judged to be non-intrusive. Two additional products, a colourful reminder sticker and celebratory poster to publicise the pilot (adjunct interventions), were separately created by the QI consultants.

The improvement team declared an aim to surpass 80% daily sample collection reliability, averaged over a week, among patients with central venous access defined as documented completion of the two-step supply placement and blood draw procedure by bedside nurses and the intravenous team, respectively. The 80% target was chosen by stakeholders, in the absence of any objective baseline data, to be an attainable but not impossible stretch goal[7] per their experiential gestalt and in accordance with the Realistic and Achievable components of a Specific, Measurable, Achievable, Realistic, Time-bound goal,[8] although a time frame for reaching this benchmark was not explicitly stated.

Process measure was the signing of the shared-accountability form by each party. Structure measure was the count of patients with central venous access who had labs ordered each day. No balance measures were included. Given the project's partly instructional and motivational nature, failed sample collection for reasons beyond staff control (eg, clotted access or patient refusal) were not counted against either party when annotated, and project scope was limited to this single step. Downstream links in the lab turnaround chain (eg, accession, analysis, reporting) were intentionally not tracked, nor was clinical decision-making facilitated by these results. Hence, the best approximation of an outcome measure that the team incorporated was presence versus absence of nursing complaints around sample collection.

Owing to the novice skill of most team members, the QI consultants elected to concentrate on the fundamentals of PDSA including longitudinal data gathering and regular meetings to review trends and determine next steps rather than enforce a strict improvement methodology. Due to concomitant personnel shortages and competing priorities including a triennial Joint Commission survey and transition to a new EHR, a pen-and-paper intervention was intentionally selected for its simplicity and to insulate the project from EHR-related risk. Because the existing process also avoided the EHR and sample tube exchange occurred away from any computer, a pen-and-paper approach further limited the degree of change imposed and placed the intervention temporally and spatially closer to its corresponding task.

Data were aggregated by week and displayed over time as both a standard run chart and a bar graph categorising missing signatures by party (eg, none, bedside nurse only, intravenous team only or both). Party identities have been concealed in this report. Uninterrupted data collection was maintained for 60 weeks from 16 February 2019 to 7 April 2020, and standard mathematical rules for run charts (eg, shifts, trends and astronomical points relative to the baseline median, which was calculated using the first 10 weeks of data, as well as the frequency of runs above and below this value) were applied to

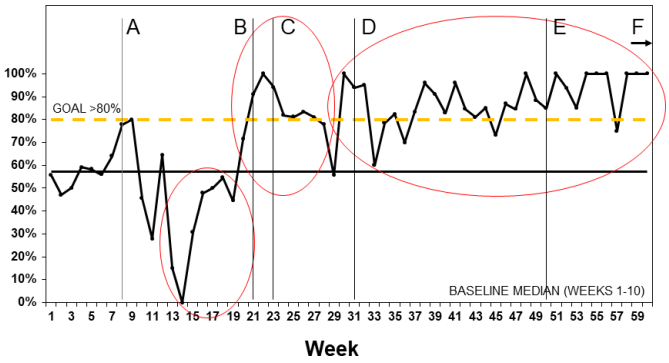


**Figure 1** Shared-accountability form usage as a surrogate measure for lab draw completion displayed over time. Goal rate >80% is indicated by the thick dashed horizontal line while baseline performance 57.1%, which reflects the median over weeks 1–10, is indicated by the thick solid horizontal line. (Top) Annotated events during the 60-week pilot include (A) the inaugural data review session on week 8, (B) second data review session on week 21, (C) introduction of the high-visibility reminder sticker on week 23, (D) third data review session and commencement of audit and feedback to staff using performance graphs on week 31, (E) start of spread to other acute care units around week 50 and (F) production of the celebratory poster beginning week 65 with distribution following later in the third fiscal quarter of 2020. Statistically significant shifts of six or more consecutive data points above or below the baseline median are circled.

distinguish statistically significant change from random noise.[9] Causality was deduced if an intervention preceded and occurred in close temporal approximation to such a statistically significant inflection.

This QI project was determined to not constitute human subject research by joint review of the Human Research Protection Programme and the Quality, Safety and Value service line at our institution. The Revised Standards for Quality Improvement Reporting Excellence was referenced during manuscript preparation.[10]

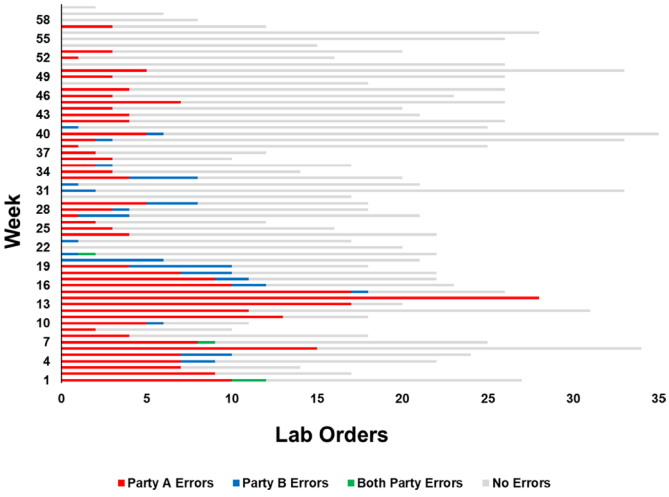


**Figure 2** Shared-accountability form error rate categorised by party over the 60-week pilot. Size of each bar represents the total number of ordered lab draws among patients with central venous access that week (median weekly volume 21, IQR 17.75—26).

## RESULTS

The shared-accountability form (first intervention) was introduced at project inception, and this allowed capture of baseline performance, which revealed median 57.1% daily sample collection reliability, averaged over a week, during the first ten weeks of observation (figure 1). In only one of those initial weeks did performance exceed the goal of 80%, with most missing signatures during this period attributed to party A (figures 1 and 2). Baseline data were reviewed by the improvement team on week 8 with no specific recommendations made at that time (figure 1A).

Performance subsequently nadired on week 14 when no ordered lab draws were recorded as complete, with all errors attributed to party A (figures 1 and 2). The improvement team met again on week 21 to review interval developments (figure 1B). This week coincided with the first instance when the prespecified >80% sample collection reliability goal was achieved, driven by a substantial increase in party A signatures (figures 1 and 2). Party B performance remained stable throughout the project (figure 2). A high-visibility reminder sticker affixed to the clipboard was introduced on week 23 (adjunct intervention; figure 1C). Lastly, staff-facing visual feedback graphs (second intervention) commenced on week 31 coincident with the third improvement team meeting (figure 1D). Updated graphs were thereafter furnished monthly until pilot conclusion on week 60 when the ward was repurposed to treat patients with COVID-19.

From week 22 to end of data gathering, performance regularly exceeded the 80% target with occasional non-sustained dips below this threshold (figure 1). Sample collection reliability was 100% during 9 of those 38 weeks (figure 1). Weekly lab order volume was stable from project start until week 56 (median 21, IQR 17.75–26) when COVID-19 infections accelerated (figure 2). Statistically significant shifts of six or more consecutive points lying above or below the median were recorded for weeks 13–19 (worse than baseline), 20–28 (better than baseline) and 30 through 60 (better than baseline; figure 1).[9] These periods corresponded approximately to when parties A and B supervisors first became aware of own group performance (weeks 8–30), followed by wider dissemination to all staff through visual feedback graphs (weeks 31–60).

After verifying practice sustainment on the pilot unit, the shared-accountability paper form was replicated across the remaining two acute care wards around week 50 (figure 1E). To encourage adoption, posters celebrating the original project team and expansion area nursing leaders were hung throughout the medical centre (adjunct intervention; figure 1F). Random checks performed in autumn 2020, 6 months after the pilot ended, revealed resurrection of this practice on the pilot

unit after converting back to oncology care and confirmed uptake in the expansion wards, although the number of patients with central venous access in these general acute care areas was much lower.

## DISCUSSION

In our single-centre experience, a non-intrusive shared-accountability signature/countersignature paper form (first intervention), coupled with non-punitive, no blame (ie, Just Culture) yet transparent feedback, was effective at nudging staff towards desired behaviours and sustaining those behaviours once established. Our leading hypothesis that supervisor awareness of own group performance both in absolute terms and relative to other process stakeholders drove the impressive gains immediately before week 21 is plausible. This change predates all other interventions except data review with parties A and B supervisors on week 8, and the leap occurs shortly before the planned second meeting with those supervisors on week 21 during a period of heightened internal pressure to deliver better results. Based on this suggestion, we have applied the same approach of presenting raw performance data to supervisors in a common forum for other clinical processes such as interfacility transfer for acute myocardial infarction and emergency department patient flow; similar results have been observed (data not shown).

Admittedly, the concept of transparently sharing data is not a novel concept and, in fact, comprises an essential developmental goal emphasised by the Joint Commission in its High-Reliability Healthcare Maturity Model.[11] Still, translating this intention into practice can be difficult, and it is here where the signature/countersignature form proved especially useful to our organisation by permitting rapid capture and dissemination of performance data where those data did not previously exist and where organisational self-awareness was deficient.

While no formal change management approach was selected by the improvement team, the arc of this project generally adheres to Lewin's Theory of Planned Change, which divides change efforts into three phases: (1) unfreezing the current state, (2) transitioning to the desired future state and (3) refreezing that future state once realised.[12] The pilot unit CNL was instrumental to this sequence by first recognising the problem of missed blood draws among patients with central venous access, assembling an improvement team in response, and later promoting desired practices on her unit. By occupying a leadership position on the pilot ward, she served as a steward for the shared-accountability form, advocate for its use, and bidirectional data conduit between the QI consultants and the parties A and B end-users. These contributions conform to the responsibilities—and deliver on the promise—of the CNL role as envisioned by the American Association of Colleges of Nursing to serve as a point-of-care leader, lateral integrator of hospital functions, and health system improvement agent.[6 13–15]

In our experience, the pairing of CNL to QI specialists was especially effective, with the former able to focus on unfreezing and transitioning staff behaviour according to Lewin's model while the latter could concentrate on refreezing the desired outcome. To accomplish this, the QI consultants crafted an audit and feedback plan incorporating elements found in a 2012 Cochrane Review to maximise effectiveness of this technique, specifically (1) communicating feedback through a supervisor or colleague (in this case, the CNL and intravenous team leaders), (2) presenting it both verbally and in writing (in this case, graphically), (3) incorporating clear targets and an action plan and (4) delivering the feedback repeatedly.[16] In fact, by publicly sharing performance over 7 months and extending the pilot to longer than 1 year, usage of the shared-accountability form may have been habituated through sheer repetition. Moreover, the QI specialists helped the project team to tackle organisational challenges and coached members, especially the pilot unit CNL, on more advanced improvement topics such as scope definition and data display, thereby enhancing the QI skillsets of those employees.

To better meet the twin goals of low operational disruption and sustained behaviour change, the QI specialists employed behavioural economics strategies throughout this project, including in the selection of a transparent shared-accountability mechanism as the primary intervention and publication of a celebratory poster depicting the pilot and expansion ward stakeholders as a unified team. In the former instance, it was hoped that normative social pressure, similar to effects previously described for antibiotic prescribing patterns,[17] would encourage form usage by both parties to avoid the appearance of delinquency. In the latter case, the celebratory poster was meant to leverage the IKEA effect, a behavioural economics concept named after the Swedish self-assembly furniture maker, in which individuals are known to impart greater value to things they produce rather than merely appropriate.[18] Although timing argues against the celebratory poster having influenced the initial performance leap ahead of week 21, it may have helped those gains to persist once they had been realised. Lastly, we speculate that the shared-accountability form could have served a functional role by acting as a crude checklist. However, neither of these latter possibilities was investigated further; both remain conjecture.

Whether through raising situational awareness among supervisors, applying normative social pressure, acting as an additional job aid or a combination of these and other dynamics, the simple signature/countersignature form positively changed staff behaviour. Furthermore, its unobtrusiveness along with negligible resource utilisation make it potentially well suited to assess and advance performance in a variety of shared-responsibility healthcare scenarios such as shift-to-shift handoffs, bedside procedures, hospital discharges, among others.

The chief strength of this project was its simplicity. It was easily executed by a team of front-line employees supported

by QI consultants whose involvement was limited to proposing interventions (some of which were likely superfluous), devising refreezing strategy and supplying graphs. For most staff, the only additional encumbrance was signing the form, and we speculate that the neutrality of this scheme with respect to workload likely hastened its adoption and encouraged its sustainment. Notably and unlike many other improvement efforts at our institution, this practice outlasted the early COVID-19 pandemic, something that we again attribute to its simplicity.

The results of our local QI project may not be generalisable, and replication of this approach at other institutions and for other applications should be accompanied by independent evaluation. We also recognise that the underperformance observed in earlier weeks may reflect omissions in signing the paper form but not in completing the actual duties for which those signatures serve as attestation. Thus, it is plausible that the true sample collection rate early on surpassed 57.1%. Nevertheless, the dramatically better performance recorded after week 21 indicates that the form and data contained therein effectively changed behaviour no matter if that change was in task execution or task documentation. Furthermore, the cessation of nursing complaints around this issue supports, at least anecdotally, an overall positive contribution of our efforts to this solitary quasi-outcome measure. Lastly, while timely sample collection does not guarantee prompt or accurate labs results, those results would be impossible without the patient's blood. Hence, we would argue that there is intrinsic value to maintaining situational awareness of some critical process measures irrespective of downstream outcomes, and in this regard, the shared-accountability form functioned admirably as a means to generate parsable data where none existed before, establish current staff performance, and immediately begin to correct practice deviations through soft behavioural nudges.

Finally, this project was chartered to improve the reliability of a single procedure (ie, sample collection) in response to staff complaints so did not examine other outcomes such as results release and patient discharge times. This design was intentional to minimise project footprint and maximise agency and relevance for the two parties involved given our concurrent desire to nurture employee engagement. Such narrow focus also eliminated the need to review patient charts, which lowered workload, reduced privacy intrusion, and further immunised the project against what became a highly turbulent EHR changeover.

For our medical centre, this project represented a no-cost, low workload improvement effort that was completed by enthusiastic frontline staff with limited support from QI experts. As hypothesised, the signature/countersignature shared-accountability form proved to be a simple, effective instrument for quantifying staff performance and promoting behaviour change. This non-intrusive intervention yielded dramatic, sustained results and offers a blueprint for future QI initiatives at our institution.

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**Data availability statement** All data relevant to the study are included in the article or uploaded as online supplemental information.



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