Practical lessons from the implementation of a surgical opioid reduction initiative in an integrated health system: a qualitative study among providers and patients

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Research Article

Keywords: implementation evaluation, contextual factors, qualitative research, acute care, opioid reduction

Posted Date: July 3rd, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2916480/v1

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Abstract

Background

Surgical opioid overprescribing can result in long-term use or misuse. Between July 2018 and March 2019, the multicomponent intervention, Minimizing Opioid Prescribing in Surgery (MOPiS) was implemented in the general surgery clinics of five hospitals and successfully reduced opioid prescribing. To date, various studies have shown a positive outcome of similar reduction initiatives. However, in addition to evaluating the impact on clinical outcomes, it is important to understand the implementation process of an intervention to extend sustainability of interventions and allow for dissemination of the intervention into other contexts. This study aims to extract practical lessons through evaluation of the contextual factors impacting intervention implementation.

Methods

We conducted a qualitative study with semi-structured interviews held with providers and patients of the general surgery clinics of five hospitals of a single health system between March and November of 2019. Interview questions focused on how contextual factors affected implementation of the intervention. We coded interview transcripts deductively, using the Consolidated Framework for Implementation Research (CFIR) to identify the relevant contextual factors. Content analyses were conducted using a constant comparative approach to identify overarching themes.

Results

We interviewed 15 clinicians (e.g., surgeons, nurses), one quality representative, one scheduler and 28 adult patients and identified three key themes. First, we found high variability in the responses of clinicians and patients to the intervention. There was a strong need for intervention components to be locally adaptable, particularly for the format and content of the patient and clinician education materials. Second, surgical pain management should be recognized as a team sport. We identified specific gaps in the engagement of team members, including nurses. We also found that the hierarchical relationships between surgical residents and attendings impacted implementation. Finally, we found that established patient and clinician views on opioid prescribing were an important facilitator to effective implementation.

Conclusion

Successful implementation of a complex set of opioid reduction interventions in surgery requires locally adaptable elements of the intervention, a team-centric approach, and an understanding of patient and clinician views regarding changes being proposed.
Prescription opioids remain a driver for the ‘opioid epidemic’ in the United States. Opioids prescribed following surgeries significantly contribute to this epidemic and can result in long-term opioid use. It is estimated that, annually, 5.7 million Americans continue to fill opioid prescriptions more than three months after their surgery. Long-term use is indicative of both chronic pain resulting from the procedure as well as non-medical use. Additionally, overprescribing of opioids after surgery impacts people within the larger social environment of the individual patient. On average, 70–90% of prescribed opioid pills remain unused after surgery. For the 9.5 million annual nonmedical users of prescription opioids, unused medications obtained from friends and family was the most common source. Therefore, it is important to avoid surgical overprescribing to prevent subsequent non-medical use of leftover opioids by patients and by their family members and friends.

Growing awareness of the negative impact of overprescribing of opioids in surgery led to the development of numerous quality improvement initiatives to minimize surgical opioid prescribing across the U.S. Best practices to safely reduce the amount of opioids used in the perioperative setting, while maintaining adequate pain control, include the use of non-opioid analgesics as first-line therapy with opioid supplementation, if needed, setting appropriate pain management expectations and increasing patient understanding of the benefits and potential risks of various pain medications, and education to clinicians with evidence on alternatives to opioid analgesics for pain management.

Based on national guidelines and available evidence of best practices that balance opioid reduction with postsurgical pain control, we developed a multicomponent intervention, Minimizing Opioid Prescribing in Surgery (MOPiS) aiming to minimize opioids prescribed and used at and following discharge. The intervention incorporates six components targeting clinicians and patients, including provider and patient education, prescribing feedback reports, electronic health record order sets with procedure-specific default opioid quantities and opioid disposal. Figure 1 provides a detailed description of the intervention components. The intervention was implemented in general surgery clinics across five hospitals throughout one health system between July 2018 and March 2019.

The MOPiS intervention was demonstrated to be successful in reducing opioids prescribed at discharge, and this was true even when adjusting for temporal trends. Other studies of opioid reduction initiatives in surgery have evaluated and demonstrated effectiveness on minimizing opioid prescriptions (see e.g., Howard et al, Tran et al and Mark et al). However, in addition to evaluating the impact on clinical outcomes, it is important to understand the implementation process of an intervention. Such information can be used to extend sustainability of interventions and for dissemination of the intervention into other contexts. The implementation process can be evaluated by assessing how contextual factors impacted the success or failure of an intervention. Contextual factors are constructs that have been associated with effective implementation related to the intervention, outer setting, inner
setting (hospitals and clinics), individuals (patients, clinicians, other stakeholders), and the implementation process.\(^{(36)}\)

In this study, we use qualitative methods to evaluate the contextual factors that facilitated (or hampered) implementation of the MOPiS intervention. Based on the evaluation we aim to identify overarching themes and lessons that can be used for implementation of other similar initiatives.

**METHODS**

**Study design and sample**

We conducted a qualitative study to investigate clinician and patient experiences with the implementation of the multicomponent intervention. Data were collected in five general surgery clinics at five hospitals within the Northwestern Medicine health system in Chicago, IL, between March and November of 2019. We purposefully selected all five general surgery clinics based on their participation in the MOPiS intervention. Within each clinic we invited the stakeholders (clinicians and non-clinicians) of each clinic via phone calls and e-mails. We also invited a convenience sample of patients of the participating surgeons for interviews in the waiting room of the clinics. All adult, English-speaking, patients who visited the general surgery clinic for a postoperative visit on the days of data collection were invited to participate in a one-time interview after their consultation. Interviewees in each clinic were invited until saturation was reached for the respective clinic.

The study was approved by the Northwestern University Institutional Review Board (STU00205053). To report study methods and results, we used the Consolidated criteria for reporting qualitative studies (COREQ) 32-item checklist.

**Data collection**

A multidisciplinary research team including a PhD expert in qualitative research methods (JJ), an academic surgeon with a PhD and MD (JS), three PhD health services researchers (WS, SB, RH) and two Master's level health services researchers (MS and CI), developed semi-structured interview guides (see Appendices A-B). All researchers are female, except for JS, who is male. The interview guides focused on the implementation of the six intervention components and explored how this was affected by contextual factors. Intervention components covered in each of the interview guides depended on the role of the interviewee. For example, patients were asked about the education that they received regarding pain medications, and clinicians were asked about their routine use of the educational brochures. Development of the questions on contextual factors was guided by the Consolidated Framework for Implementation Research (CFIR).\(^{(36)}\) The interview guide incorporated questions about the factors impacting the implementation process. For example, clinicians were asked about the barriers that they encountered in providing patients education about postsurgical pain management.
The interview guides were pilot tested in one clinic and then further refined based on discussions with the multidisciplinary research team. The interviews with the clinicians were conducted (by authors MS, JJ, WS) in person or via phone. The interviewees had no prior relations with the interviewers but were provided with information about the goal of the study and the role of the interviewer. All interviews with patients were conducted in person. Patient interviews (conducted by authors MS, JJ, WS) lasted approximately 15 minutes and clinician interviews lasted approximately 30 minutes. In some cases, a patient family member or friend was present during the patient interview. All interviews were audio-recorded upon consent of the interviewee, and we did not take field notes. The recordings were transcribed verbatim and not returned to the participants for comments. All transcribed interviews were de-identified upon completion, but participant roles were retained. Transcripts were not shared with the interviewees. Finally, all transcripts were transferred into MAXQDA software (Version 2018, VERBI Software GmbH, Germany), for coding and analyses.

Coding and data analysis

Upon completion of the interviews, our research team developed a codebook covering the six MOPiS intervention components (patient education, clinician education, multimodal pain control, prescribing data feedback, EHR optimization, and safe drug disposal) and the constructs of the CFIR framework on contextual factors.

Researchers WS, JJ, MS coded all transcripts in dyads, using a deductive logic, following the CFIR framework. Following independent coding, the coded transcripts were discussed by the dyad and any discrepancies were resolved with a third researcher.

Following the coding process, content analyses were conducted using a constant comparative approach. The coded data was discussed with all researchers to identify overarching themes within and across the intervention components of how the contextual factors contributed to implementation of opioid reduction initiatives. Data from the 5 surgical clinics and stakeholders (clinicians, staff, and patients) were analyzed concurrently to triangulate data. Results were not discussed with the interview participants.

RESULTS

We interviewed 45 participants, including 15 clinicians (8 nurses, 4 surgeons, 1 nurse educator, 1 advanced practice provider (APP), 1 surgical resident), 1 quality lead, 1 surgery scheduler, and 28 patients. Of the non-patients, four interviewees were male and 13 were female. The number of participants varied between hospitals depending on the size and willingness of clinicians and patients to participate. Four clinicians and eight patients declined to participate.

We identified three broad themes of needs related to conducting opioid reduction initiatives: (1) Reasons for variability in adopter responses to the intervention, (2) Surgical pain management as a ‘team sport’
and (3) Prior established patient and clinician beliefs regarding opioid risks as a facilitator. Sub-themes are denoted in bolded text.

**Theme 1: Reasons for variability in adopter responses to the intervention**

We identified a high variability in responses to the intervention, rooted in various contextual factors including their individual characteristics, preferences, and adaptability of the various components. Table 1 includes representative quotes from this theme and its sub-themes.
Table 1
Representative quotes for the theme ‘Reasons for variability in adopter responses to the intervention’

<table>
<thead>
<tr>
<th>Sub-Themes</th>
<th>Intervention components</th>
<th>Representative quotes for the sub-theme and intervention component</th>
<th>Contextual factors related to this sub-theme (CFIR Constructs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Variability in clinicians’ and patient’s characteristics and preferences</td>
<td>Prescribing data feedback</td>
<td>Nurse educator interviewee [about the prescribing feedback dashboard]: Do we think that they’re getting in there and looking? Quality lead: Dr. [name] I do know is looking. She has talked about several times like how it’s driven her change. She has also looked at her nurse practitioners. Dr. [name] has looked a couple of times I believe...But, he has some ideas about quality sending him his reports...he wants us to [send the reports].</td>
<td>Innovation characteristics (Design quality &amp; packaging)</td>
</tr>
<tr>
<td></td>
<td>Clinician education modules</td>
<td>Surgeon: Well, the computer modules, in all honesty, are kind of a pain. I spend way too much time on the computer doing things, so doing another thing, responding to another email, is just very time consuming, so it’s actually more, probably, I don’t want to say convenient, if it’s in a form held at the surgery department meeting where someone has 15 to 20 minutes to talk about it. You got all the surgeons there, everybody can hear their questions.</td>
<td>Innovation characteristics (Design quality &amp; packaging)</td>
</tr>
<tr>
<td></td>
<td>Prescribing data feedback reports</td>
<td>Interviewer:...the final intervention was the surgical prescribing report and you said that you opened it.. Do you recall how you were doing or did you have any questions about it or any thoughts after seeing it? Surgeon 1: I was doing very poorly. I was like at the very bottom. I was one of the worst people.. I was definitely more proactive after that about every time I work with a new resident going over the correct number for each operation was. Surgeon 2: Without a report card, I know that I’m prescribing less and my patients are getting less than they were two years ago. It’s a huge difference.</td>
<td>Characteristics of individuals (Knowledge &amp; beliefs about the intervention)</td>
</tr>
<tr>
<td>C. Need for interventions to be locally adaptable</td>
<td>Patient education: Brochure</td>
<td>Patient interviewee: I had to call Dr. [name]'s office the next day to remind myself of the flip flopping Tylenol and Ibuprofen protocol, because I think the way their software is set up for these papers, if you get the prescription, the printout only gives you the prescription information, but because I didn’t want to take the prescription, I [crosstalk] remind myself of the protocol of flip flopping</td>
<td>Innovation characteristics (Design quality &amp; packaging)</td>
</tr>
</tbody>
</table>
Whereas some individuals responded favorably and quickly adopted the practices, others did not. For all components, except for multimodal pain management strategies, we found variability in the adoption of the component between providers. The variability was also visible on the patient side, for example in whether they read the pain management information brochure. Variability in the responses, at least in part, stemmed from variability in clinicians’ and patients’ characteristics and preferences for the ‘design’ of the intervention components (CFIR constructs ‘Characteristics of individuals - Knowledge & beliefs about the intervention’ and ‘Innovation characteristics - Design quality & packaging’). For instance, there was variation between clinicians in how they preferred to receive the feedback reports on their opioid prescribing data. Some surgeons preferred to receive individualized reports in their email, whereas others liked using the dashboards to review the prescribing within their practice. A nurse expressed the desire to share the reports publicly in the lounge to spur competition. Clinician preferences for ‘design quality and packaging’ also varied for the education modules, e.g., during the interviews some clinicians indicated that they would have preferred in-person training to the virtual modules that were provided.

The second sub-theme from the interviews with clinicians was that implementation could be impacted by the adaptability of the intervention to meet the needs of clinicians and of patients (CFIR construct ‘Innovation characteristics - Design quality & packaging’). The interviews revealed that some of the intervention components were not adaptable to the local needs of clinicians and patients, whereas others were. The brochures including patient education on safe opioid use were created for the hospital system and could not easily be adapted or edited by each clinic. This was also visible in the experiences of patients, e.g., one patient indicated that they needed to call their doctor about how to take non-opioid medications, as this information was not included in the standardized brochure. Further, several clinicians indicated that they would have preferred to integrate the information from the brochure within existing materials and others noted that the materials were only available in English.

**Theme 2: Surgical pain management as a ‘team sport’**

Second, we identified that surgical pain management involves a broad team and implementation success varied when not all stakeholders were engaged and the relationship between the various team members are not considered. Table 2 includes examples and representative quotes of this theme and the sub-themes.
<table>
<thead>
<tr>
<th>Sub-Themes</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Need for engagement</strong></td>
<td>Clinician education</td>
<td>Interviewer 2: As best you can remember, has there been anything that's come through about opioid prescribing?</td>
<td>Process (Engaging)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nurse interviewee: No.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Interviewer 2: There hasn't been a meeting or anything and people have talked about extending to do this?</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Nurse interviewee: Nope.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Interviewer 2: Would that be helpful to you?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nurse interviewee: Mm-hmm (affirmative). Well and I think part of it is, it would be helpful for the follow-up portion when patients are calling and asking for refills.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prescribing data feedback</td>
<td>Interviewer: And then as part of the program we have also sent out reports to the individual prescribers about your prescribing habits. Were you aware of these reports?</td>
<td>Process (Engaging)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nurse interviewee: No, they don't really share that with us.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clinician education: modules</td>
<td>Interviewer: And do you also remember if what you learned from [the education modules]?</td>
<td>Process (Engaging)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nurse interviewee: Yeah it did because you know, we educate before surgery and so we are now mentioning that and preparing patients for that when we do our education prior to surgery. It gives you some background so it is not something that where I specifically have a in depth conversation with the patient but if the patient is asking questions about pain meds or something, for example, we used to say you will go home with pain meds, Well I don't say that anymore because they may not go home with pain meds.</td>
<td></td>
</tr>
</tbody>
</table>
### B. Hierarchical relations between care providers

<table>
<thead>
<tr>
<th>Sub-Themes</th>
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<th>Contextual factors related to this sub-theme (CFIR Constructs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical relations between care providers</td>
<td>EMR Optimization (order sets)</td>
<td>Resident interviewee: <em>And sometimes there are attendings who are very old school and always prescribe the same amount every time, and they’ll tell you ‘Give them 15 of this’, even though the order says ‘Oh, you should only be giving five.’ And as a resident, you can’t go against the attending who’s saying that, so then we’ll be noncompliant, and then it would be like well is that really their fault. So I don’t know. But I think now, they did send that email where we can look up the thing.</em></td>
<td>Inner setting (Culture)</td>
</tr>
</tbody>
</table>

The first sub-theme, **need for engagement of all stakeholders** (CFIR construct ‘Process – Engaging’), highlighted that people from specific roles, including nurses and non-clinical professionals, were sometimes overlooked in the implementation of specific components. A surgeon indicated that disseminating the prescribing data feedback was important for residents as well as the primary surgeon as the residents are the ones responsible for most of the opioid prescribing. Initially, the feedback reports were only shared with the primary surgeons, but this was extended to other prescribers including residents based on feedback. This modification to include more of the team members helped making more team members active participants in the intervention. Except in a few instances, nurses were not aware of the prescribing data feedback reports, and this lack of team integration likely limited project success for those teams. When nurses were aware of the reports, they often ensured the reports were reviewed at regular meetings.

Regarding clinician education, while many surgeons attended grand rounds where the opioid initiative was discussed, nurses, as well as other professionals, did not attend these presentations. A nurse indicated that being informed about the grand rounds lectures would have been helpful as this would have been important information in their role of responding to patient phone calls discussing refills after discharge. A surgery scheduler also indicated that being more informed would have helped them reinforce patient education (e.g., surrounding the importance of disposal). The clinician education modules, on the other hand, were disseminated to all clinicians involved in the surgical care pathway. This supported their goal of minimizing opioids, not just by prescribing fewer but also through nurses tailoring their patient education. E.g., a nurse indicated that she learned from the module that she should no longer tell patients that they go home with pain medications.

We also identified **hierarchical relationships between care providers** that could interfere with adoption of certain intervention components (CFIR construct ‘Inner setting – Culture’). Resident surgeons were exposed to education and prescribing tools, but they voiced concerns about prescribing in ways that were not aligned with what the attending surgeon requested. Discharge pain medication prescribing after
inpatient stays is often managed by surgical residents, yet the ultimate responsibility for the patient’s wellbeing lies with their supervising attending surgeon. Therefore, while the order sets provided residents with a tool to align their prescribing habits with the health system recommendations, there was sometimes tension if the attending surgeon had traditional prescribing habits that exceeded hospital recommendations. Residents expressed that they felt pushed into an uncomfortable position by this tension. While clinicians were aware of the order sets, they were not universally adopted. A resident indicated that they felt supported by an email with information about the order sets and quantities providing them something tangible to back-up their choice in their communication with attending surgeons.

**Theme 3: Prior established patient and clinician beliefs regarding opioid risks as a facilitator**

Finally, we saw that the established **awareness of the risks associated with opioids contributed to the success of intervention implementation** (CFIR construct ‘Characteristics of individuals-Knowledge & beliefs about the innovation’). Table 3 includes representative quotes from this theme. Both patients and clinicians referenced already knowing about many risks of opioids and reasons to avoid or limit their use. When asked, patients consistently indicated knowing about risks such as addiction and side-effects. Various factors impacted patients’ knowledge, including what they had heard in the media, negative experiences of friends who became addicted, and their own experiences with opioids from prior procedures. As a result, patients were receptive to the patient education and their providers’ plan to minimize opioid prescribing. E.g., they consciously followed their doctor’s instructions citing long term risks of heroin addiction and patients appeared to less frequently fill their prescriptions when they did not consider the opioids necessary to manage pain. Receptiveness to the change was also visible in patients’ expressions of satisfaction with pain management. Ultimately, most patients indicated that they considered their pain manageable, in some cases with opioid use and in some cases with alternative pain management strategies alone, such as acetaminophen and ice packs.
Table 3
Representative quotes for the theme ‘Prior established patient and clinician beliefs regarding opioid risks as a facilitator’

<table>
<thead>
<tr>
<th>Sub-Themes</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Awareness of opioid risks</td>
<td>NA</td>
<td>Patient interviewee: “I know I come from the inner city here in [city], so I know a lot about opioid addiction. I’ve got friends that had problems when I was growing up with heroin. I’ve had recently a couple of friends, I work in an industry, the food service industry. I used to bounce bars, I used roadie for bands, so I know a lot of band members that have OD’d and are no longer with us.”</td>
<td>Characteristics of individuals\Knowledge &amp; beliefs about the innovation</td>
</tr>
<tr>
<td>Patient education</td>
<td>Patient interviewee: “I was like, I manage my pain. I’m good.” Interviewer: “And you took the medications was discussed with your doctor?” Patient: “Completely. Yeah, I’ve used it before. I mean, I’ve had a few surgeries. I know about pain management, I know how to take that stuff, like I said, I’m very stubborn. Set in my ways, where it’s just like, you know what? It hurts, but you know what? It doesn’t hurt any worse than if I were to get addicted to heroin.”</td>
<td>Characteristics of individuals\Knowledge &amp; beliefs about the innovation</td>
<td></td>
</tr>
</tbody>
</table>

The clinicians also indicated that they were already aware of many risks associated with opioids and, in some cases, practices focused on minimization of opioids were already incorporated in their workflow. For example, because of implementation of Enhanced Recovery Protocols for some procedures, patients already received education on minimized opioid use. Therefore, it was clear that the media attention to this topic and general understanding of opioid risks were helpful in improving implementation.

**DISCUSSION**

Many surgical procedures result in enough pain to require some opioids to manage the pain. However, there is a need to balance the benefits of the opioids prescribed with the associated risks. In the U.S., reducing surgical prescribing is more important than ever given that the opioid epidemic continues to worsen in recent years(1) and physicians continue to prescribe high amounts of opioids after surgery.(37) The epidemic is not isolated to the U.S. either, with increases in opioid-related deaths observed in, for example, England, Sweden, and Lithuania.(38)

This study identifies lessons for the implementation of a complex, multicomponent intervention to reduce the quantity of opioid pills prescribed at surgical discharge in a diverse health system. While some of
these lessons are applicable to and well-known from implementation of interventions in other contexts (e.g., the importance of adaptability), some lessons specifically relate to opioid reduction initiatives (e.g., the importance of a multi-component approach), and to the surgical context (e.g., the importance of considering hierarchy).

The first lesson is that it is essential to make intervention components adaptable to address individual patient and provider needs and the hospital-specific context. This was underlined by the variability of their responses to each intervention component. Stakeholders were consulted prior to implementation of the MOPiS intervention, and we identified specific needs for the intervention design which supported implementation. Even though the intervention components aligned with the clinician preferences in many cases, there were needs for further adaptations. For example, the patient education brochures did not always contain the information that providers wanted to have included and could not be adapted. Previous studies have shown that adaptability can increase feasibility and acceptability of an intervention. Simultaneously, it can have the unintended consequence of lowered fidelity to implementation and a subsequently diminished effect on outcomes. Therefore, practitioners need to receive guidance on adaptations, e.g., through decision aids. Further, there may be boundaries, legal and within health system policies, to the possibilities of making interventions adaptable. For the MOPiS intervention such boundaries were encountered, e.g., from a legal perspective opioid disposal boxes could only be placed in a specific place in the hospital where security can be guaranteed.

Second, even if the intervention components are adaptable to individual needs, there is still a need for a multi-component strategy to address opioid prescribing behavior, because some individuals may not be receptive to specific components, which we observed for the individual feedback reports. The intervention employed multiple strategies to change clinicians’ opioid prescribing behavior, for example by providing them with individualized feedback on their prescription behavior and by providing them an online education module. An extensive review of techniques to change physicians’ behaviors showed that there is not a unifying approach that is effective and therefore multiple interventions yield better results. Our data further supports this assertion. Additionally, the intervention addressed patients, which further contributed to implementation success.

The third lesson was the need to engage all team members across the surgical continuum, including surgeons, all nurses (e.g., clinic, pre-op, post-op, floor), residents, and nonclinical staff such as schedulers. Within the MOPiS implementation process the importance of engagement of some team members was sometimes overlooked. While grand rounds presentations were successful at engaging prescribers, the opportunity to engage people in other roles through this mechanism was missed. To ensure the success of each intervention component there is a need to recognize that surgical pain management is a team sport. Although surgeons in many cases are the prescribers of the actual medications, other behaviors can support or act as a barrier to the desired change in prescribing. For example, while the feedback reports were designed for and disseminated to prescribers, other staff might have been able to support the use of these reports. It is important to understand which staff members may encounter the patient
and how they are involved in pain management when targeting surgical opioid reduction in a specific setting. Based on that information, tailored education to all clinicians and staff can avoid inconsistent messaging towards patients.

The fourth lesson was that behavior change interventions in surgery need to account for the role that the hierarchal relationships within the field play and how it impacts behavior. This is particularly relevant to opioid prescribing as it relates to a surgical residents’ role and attending surgeon beliefs and practices. This hierarchy should be considered in the implementation process of the intervention. A systematic review identified ‘negative hierarchy’ hampering quality improvement and resulting in anxiety and fear. (45) Empowerment of people at all levels of care to advocate for safer care practices around opioids can potentially be supported by tools such as checklists. (45, 46) In our initiative, the order set, in combination with an email communication, empowered residents to prescribe according to the new recommendations. However, as the hierarchical relationships are persistent and may not be fully overcome by empowerment tools, there will remain a need to change the beliefs of the attending physicians first.

Finally, we identified that the current culture surrounding opioid use in medicine presents us with an opportunity for change. Both clinicians and patients are acutely aware of the risks of opioids. As a result, patients are willing to limit their opioids following surgery and this creates an environment for successfully implementing prescribing reduction initiatives. Similar to our study, another qualitative study among surgical patients revealed widespread awareness among patients about opioid medications which informed their intentions about using opioids. (47) Ultimately, the patients within our study reported that they were satisfied with their pain management. Likewise, a systematic review on behavioral interventions to decrease opioid prescribing after surgery found that of 18 studies the majority of studies did not find worse pain control following reduced prescribing initiatives. (48) In addition, a statewide opioid reduction effort also found that, following implementation of default quantities at discharge, despite significant decreases in both prescribing and consumption, patient-reported satisfaction and pain scores remained stable. (26)

Our assessment, prior to the MOPiS implementation showed that some physicians were worried about a negative impact on patient satisfaction rates. (19) Such concerns may cause resistance to changing prescribing practices. The accumulated knowledge about impact on patients can be used when introducing similar interventions in other populations to convince clinicians that changing prescribing behavior does not lead to lower patient satisfaction.

**Limitations**

There are several limitations of this study. Because our data is interview based, we are not able to make causal inferences about the relation between contextual factors and implementation failure or success. However, by involving a wide variety of stakeholder representative groups including patients, QI representatives and various clinician groups, we were able to triangulate perspectives and identify themes universally considered to be important. Second, the study did not focus specifically on refined
implementation outcomes, such as acceptability, adoption, and sustainment but rather on implementation broadly as experienced by the staff and patients. Specific implementation outcomes are hard to measure reliably using only qualitative data and would require a mixed-methods approach including other resources such as electronic health record data. Third, the sample of clinicians who participated in the interviews is small and may represent a more engaged group who are interested in reducing opioid prescriptions. However, the sample represents a large portion of the prescribers who were exposed to the intervention. Further, our quantitative analyses confirmed that reduction efforts were successful.

**Implications**

Based on the lessons learned from this study, in combination with what is already known about opioid reduction initiatives in surgery, we identified several lessons focusing on intervention content, stakeholder engagement and communication and the outer setting context. These lessons can be considered by other health system representatives when initiating a similar initiative. Future research should more directly measure how strongly these implementation themes relate to the effectiveness.

**Conclusions**

Keys to successful implementation of a complex opioid reduction intervention in surgery include using multiple strategies simultaneously to address behavior change and knowledge acquisition, allowing for adaptations of the intervention wherever feasible, assuring that the implementation is team-centric reaching all members of the surgical continuum. Understanding these elements will be critical to future successful implementation.

**Declarations**

**Contributions to the literature**

- To date, studies of opioid reduction initiatives in surgery have evaluated and demonstrated effectiveness on minimizing opioid prescriptions. It is, however, also important to understand the implementation process.
- We abstracted practical lessons for initiatives, based on an evaluation using the Consolidated Framework for Implementation Research (CFIR).
- We found that opioid reduction initiatives in surgery require locally adaptable elements of the intervention, a team-centric approach, and an understanding of patient and clinician views regarding changes.
- These lessons can be used to extend sustainability and for implementation of other similar initiatives.
Ethics approval and consent to participate: The study was approved by the Northwestern University Institutional Review Board (STU00205053). All participants were consented prior to participation.

Consent for publication: Not applicable

Availability of data and materials: Not applicable

Competing interests: None

Funding: This work was supported by the National Institute on Drug Abuse of the National Institutes of Health R34DA044752 entitled “System-Level Implementation to Reduce Excess Opioid Prescribing in Surgery”.

Authors' contributions: WS, JJ, MS, RH and JS were involved in the design of the study. WS, JJ, MS, conducted the data collection and coding. WS, JJ, CI, and SB analyzed the data and discussed findings with all other authors. All authors read and approved the final manuscript.

Acknowledgements: Not applicable

References


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Figures
Intervention Components

→ **Provider Education**
  - Grand rounds on the intervention were given at each hospital.
  - Education module including education on opioid prescribing and alternative pain management strategies were disseminated to all surgical providers through integration of the online learning system.

→ **Prescribing Data Feedback**
  - Prescribing feedback reports on compliance with recommended procedure-specific quantities of pills for prescribing at discharge were disseminated to surgeons.
  - A prescriber dashboard was disseminated to surgeons to track their compliance with the recommended defaults in real time.

→ **EMR Optimization**
  - A discharge order set was integrated in the EMR.
  - The order set included the recommended default opioid quantities.

→ **Patient Education**
  - A brochure to educate patients on safe opioid use, storage and disposal was developed and disseminated to surgical providers and clinic practice managers.
  - Providers were educated through the modules and grand rounds to routinely conduct pre-operative pain expectation setting with patients.

→ **Multimodal Pain Control**
  - Providers were educated through the modules and grand rounds to routinely conduct patient education on multimodal pain control.
  - Options for multimodal pain control were included in the patient education brochure.

→ **Safe Disposal**
  - Providers were educated through the modules and grand rounds to conduct pre-operative education and post-operative follow-up about disposal with patients.
  - Options for safe disposal were included in the patient education brochure.
  - A checklist on how to install a disposal kiosk was disseminated to each hospital.

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**Figure 1**

Legend not included with this version

**Supplementary Files**

This is a list of supplementary files associated with this preprint. Click to download.
• Appendix.docx
• COREQchecklistPracticallessonssurgeryopioid.doc