Improving antibiotic initiation and duration prescribing among nursing home physicians using an audit and feedback intervention: a theory-informed qualitative analysis

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ABSTRACT

Background In nursing homes, 25%–75% of antibiotic days of treatment are inappropriate or unnecessary and are often continued for longer durations than necessary. In Ontario, physicians can receive a provincial audit and feedback report that provides individualised, confidential, data about their antibiotic prescribing. Objectives of this study were to explore antibiotic prescribing of nursing home physicians and the influence of the report.

Methods All physicians who received a personalised MyPractice: Long-Term Care report from Ontario Health (Quality) (OH(Q)) in January 2019 (n=361) were eligible to participate in semistructured telephone interviews that were recorded then transcribed verbatim. Recruitment emails were sent from OH(Q) until saturation of ideas. Analysis was conducted by two team members inductively, then deductively using the theoretical domains framework, a comprehensive, theory-informed framework to classify determinants of specific behaviours.

Results Interviews were conducted with n=18 physicians; 78% (n=14) were men, practising for an average of 27 years, with 18 years of experience working in nursing homes. Physicians worked in a median of 2 facilities (range 1–6), with 72% (n=13) in an urban setting, 56% (n=10) were medical directors for at least one home. Professional role and identity impacted all aspects of antibiotic prescribing. Key roles included being an ‘Appropriate prescriber’, an ‘Educator’ and a ‘Change driver’. For antibiotic initiation, these roles interacted with Knowledge, Skills, Beliefs about consequence, Beliefs about capabilities, and Social influence to determine the resulting prescribing behaviour. When considering the impact of interacting with the report, participants’ perceived roles interacted with Reinforcement, Social influence, and Intention. Environmental context and resources was an overarching domain.

Conclusion This theory-informed approach is being used to inform upcoming versions of existing audit and feedback initiatives. Appealing to the role that prescribers see themselves offers a unique opportunity to encourage desired changes, such as providing tools for physicians to be Educators and facilitating, particularly medical directors, to be Change drivers.

INTRODUCTION

Antibiotic use in nursing homes is an increasing concern, where as much as 25%–75% of antibiotic days of treatment may be inappropriate or unnecessary. Antibiotic treatment is uniquely challenging in this population as elderly patients are prone to both infection-related and antibiotic-related complications. Cognitive impairment and difficulty distinguishing infectious illness from comorbidity contribute to the challenge of appropriate antibiotic prescribing in this sector. The increased use of antibiotics in prescribing enrols not only the individual receiving treatment but all residents due to the increased risk of serious antibiotic-related harms such as Clostridium difficile and antibiotic resistant pathogens. Even in cases where antibiotics are indicated, they are often continued for unnecessary durations. Shorter duration antibiotic treatments (7 days or less) are as effective as longer treatments for common infections in nursing homes, yet prescribing patterns suggest many physicians remain largely unaware of this evidence. With the numerous challenges associated with antimicrobial resistance worldwide, physicians need to be aware of their prescribing practices and be supported to change in nursing homes.

A well-studied strategy for improving guideline-concordant clinical behaviour—including antibiotic prescribing practices—is audit-and-feedback (A&F). Providing healthcare professionals with a systematic measurement of their current clinical performance may overcome barriers to self-assessment, help identify suboptimal practices and motivate quality improvement efforts. Furthermore, A&F can incorporate numerous behaviour change techniques (BCTs) to


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target a range of underlying determinants of behaviour, including cognitive and affective attitudes, normative beliefs, and self-efficacy. A Cochrane systematic review found A&F to be associated with a median-adjusted risk difference of 4.3% absolute increase in healthcare professional compliance with targeted behaviours. Importantly, the benefit was even greater for studies of prescribing behaviour. Therefore, a well-designed and behaviourally targeted A&F intervention has the potential to support guideline-concordant antibiotic prescribing in nursing homes and consequently reduce antibiotic-related harms.

The Feedback to Improve Rational SSTrategies of Antibiotic Initiation and Duration in Long Term Care (FIRST AID-LTC) trial (ClinicalTrials.gov Identifier: NCT03807466) is a large active trial, with one section focusing on the impact of implementing different types of A&F interventions on physician antibiotic prescribing practices in nursing homes. To supplement the trial, an embedded process evaluation was conducted to examine the interactive processes and contextual features to help explain the overarching context of nursing homes in which this trial is based. In this manuscript, we describe the findings from interviews of nursing home physicians conducted as part of this process evaluation. Specifically, we used a theory-driven approach to explore how and why nursing home physicians receiving an A&F report may (or may not) change their antibiotic prescribing in response to the report.

**METHODS**

**Study design**

A qualitative approach with one-on-one semistructured telephone interviews was used to gain a more nuanced understanding of how the intervention (the report) was perceived by those that engaged with it. A social constructionist paradigm (p. 336–337), indicating that realities are shaped through our experiences and our interactions with others, guided the collection of the qualitative data through interviews with physicians who practise in nursing homes in Ontario. This study received ethics approval from the Women’s College Hospital Research Ethics Board, REB #2018-0166-E.

**Setting**

As of February 2019, there were 626 licensed nursing home facilities in Ontario. Adult residents live permanently in these facilities and have access to 24-hour nursing and personal care. Fifty-eight per cent of these homes were privately owned, 24% were non-profit/charitable and 16% were municipal. Many physicians work in multiple facilities with an interdisciplinary care team to monitor residents and bring in physicians as needed. In Canada, the Long Term Care Homes Act (2007) requires each home to have a medical director who is a physician. The medical director’s role is to advise on matters of medical care and consult with the director of care and other health professionals.

**Intervention**

Ontario Health (Quality) (OH(Q)), formerly known as Health Quality Ontario, provides physicians who practise in nursing homes in Ontario with quarterly A&F via their MyPractice: Long-Term Care report (referred to as ‘the report’; online supplemental 1). These confidential practice reports are disseminated online to physicians who voluntarily register to receive the feedback. The reports describe resident characteristics, personal prescribing trends for high-risk medications in nursing homes (eg, antipsychotics, benzodiazepines and so on), and antibiotic initiation and duration. Peer comparison against the overall prescribing trends across Ontario nursing homes are included. The reporting includes two pages of ‘change ideas’ that present strategies and resources designed to support physicians who are interested in changing their own, or their team’s, antibiotic prescribing behaviour.

**Recruitment**

All physicians in Ontario who received and engaged with their personalised report were eligible to be interviewed. When recruitment began in March 2019, n=361 physicians who work in nursing homes had signed up to receive the report. In this iteration of the FIRST AID-LTC trial, half (n=182) of the eligible participants received a standard PDF version of the report and the other half (n=179) received a new, interactive, online version. Perceived differences about the impact of the type of report received will be published with the results of the FIRST AID-LTC trial, while general insights about the impact of the report and the nursing home context are provided here.

To recruit participants, a statement was included in an OH(Q) online feedback survey sent to all physicians who received the report, which yielded no participants. OH(Q) then sent a dedicated recruitment email to all eligible physicians. Although recruitment was conducted by OH(Q), interested physicians contacted the research team to maintain confidentiality. Prior to the interview, all physicians received an information letter and signed a consent form. If written consent was not obtained, verbal consent was documented before the interview. Each interview participant received an $150 honorarium.

**Data collection**

The objectives and interview questions (online supplemental 2) were guided by the theoretical domains framework (TDF). The TDF is a validated framework of 84 determinants across 14 domains that is based on psychological theory and used to identify determinants of individual behaviour. It is used to inform the design of complex healthcare interventions and helps to categorise known barriers and facilitators to practise change and select implementation strategies. In addition to the behavioural approach guided by the TDF, leading A&F theory was used to enhance comprehensiveness, including the 15 suggestions for optimising A&F effectiveness from
Brehaut and colleagues, and the clinical performance feedback intervention theory. The questions were piloted on two physicians with expertise in conducting A&F studies. Demographic questions were asked ahead of the interview, including gender, role, setting (urban, rural), years in practice, years working in a nursing home, number and type of homes, number of residents per home, and whether they work in other settings, such as primary care.

Interviews were conducted by one female postdoctoral researcher (CL) with a background in health services research. As the interviewer did not have a clinical background, physicians were asked to clarify clinical responses. The interviewer did not have a relationship with the participants prior to the interview. Interviews were audio recorded then transcribed verbatim by an external third party. Any identifiable information (ie, names of individuals or institutions) was removed to ensure confidentiality. No repeat interviews were conducted.

Data analysis

A codebook was created through an iterative process during coding of the transcripts on NVivo V.12 by two researchers (CL and TS). Independent inductive coding was used first, followed by deductive coding mapping to the TDF. A framework analysis was applied as a final step to explore the potential differences between participants who were or were not a medical director. Results were summarised into tables, which were reviewed by the research team, including a representative from OH(Q). Field notes were taken throughout the interview process. Member checking was conducted to confirm results by sending a summary of findings to participants who had agreed to further contact (n=16).

Patient and public involvement

Lived experience advisors provide input to all projects conducted with this funding, including providing initial direction to focus on antibiotic prescribing. Advisors were not directly involved in the conduct or recruitment for this study. Results are shared with the advisors and discussions are underway with researchers and advisors to inform dissemination plans and future interventions.

RESULTS

Interviews were conducted with 18 physicians who practise in nursing homes; 78% (n=14) were men, practising for an average of 27 years, with 18 years in nursing homes. These physicians worked in a median of 2 facilities (range 1–6), with 72% (n=13) in an urban setting. Just over half (n=10) were medical directors for at least one facility. This sample is comparable to the overall sample of physicians who receive the Report (table 1). Interviews lasted between 21 and 60 min (average=36 min).

| Social/Professional role and identity, which refers to ‘a coherent set of behaviours and displayed personal qualities of an individual in a social or work setting’ |

Table 1 Demographic information of interview participants and of all physicians who receive the MyPractice: Long-term Care report from Ontario Health (Quality)

<table>
<thead>
<tr>
<th>Demographic information</th>
<th>Interviews, n (%/mean)</th>
<th>Physicians who receive the long-term care report from Ontario Health (Quality)</th>
</tr>
</thead>
<tbody>
<tr>
<td># of participants</td>
<td>18</td>
<td>361</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4 (22%)</td>
<td>113 (31.3%)</td>
</tr>
<tr>
<td>Male</td>
<td>14 (78%)</td>
<td>248 (68.7%)</td>
</tr>
<tr>
<td>Medical director (in at least one facility)</td>
<td>10 (56%)</td>
<td>–</td>
</tr>
<tr>
<td>Years in practice (mean)</td>
<td>2.5–52 years (27)</td>
<td>29 years (mean)</td>
</tr>
<tr>
<td>Years working in nursing homes (mean)</td>
<td>2–52 years (18)</td>
<td>–</td>
</tr>
<tr>
<td># of homes (mean)</td>
<td>1–6 (2)</td>
<td>–</td>
</tr>
<tr>
<td>Setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>13 (72%)</td>
<td>–</td>
</tr>
<tr>
<td>Rural</td>
<td>4 (22%)</td>
<td>–</td>
</tr>
<tr>
<td>Both</td>
<td>1 (6%)</td>
<td>–</td>
</tr>
<tr>
<td># of residents</td>
<td>64–350</td>
<td>–</td>
</tr>
<tr>
<td>Work in another setting</td>
<td>15 (83%)</td>
<td>–</td>
</tr>
<tr>
<td># of reports received to date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Since the report began</td>
<td>4 (22%)</td>
<td>–</td>
</tr>
<tr>
<td>1–2 years</td>
<td>6 (33%)</td>
<td>–</td>
</tr>
<tr>
<td>A few years</td>
<td>8 (44%)</td>
<td>–</td>
</tr>
</tbody>
</table>

implied all aspects of antibiotic prescribing among nursing home physicians. Three distinct roles were identified: (1) Appropriate prescriber, (2) Educator and (3) Change driver; these self-perceived roles were distinct from any formalised job responsibilities. These roles were also not static over time or consistent across settings; each role interacted with other domains to affect antibiotic initiation and duration and how they interacted with the report. Participant behaviours were considered within an overarching theme of Environmental context and resources which helped explain antibiotic prescribing behaviours in nursing homes.

**Perceived professional roles and their impact on decreasing antibiotic initiation and duration**

Table 2 summarises how each role could affect antibiotic initiation and duration.

**Appropriate prescriber**

All physicians reported their role to provide appropriate treatment to achieve ‘good patient care and outcomes’ 004 (medical director). Participants considered many factors to determine appropriate initiation, including clinical features, lab test results, patient/family preferences, and care goals. Consideration of antibiotic duration (specifically, shorter durations) was not common practice for many participants, and some needed to verify the evidence (ie, asking a pharmacist) before considering changing their practice. A few physicians saw their role as an Appropriate prescriber to prescribe for the shortest duration possible, however, it was not always clear what was meant by ‘shortest’.

[I] always write the prescription initially as a low duration or slow duration. Not only does that help conserving antibiotics, but it kind of is a reminder to myself and to staff to reassess the patient, because we have to decide whether or not to increase the length of the prescription. 017

An identified knowledge gap (Knowledge and Skills) for upper respiratory tract infections negatively interacted with (and challenged the integrity of) the Appropriate prescriber role.

We’ve had tons of focus on reducing the antibiotics for UTIs, for instance, in long-term care, but there’s not a really great approach to deciding whether to treat upper respiratory symptoms with antibiotics. 013 (medical director)

The ability to apply existing Knowledge and Skills in line with the evidence was influenced by Social influence and Beliefs about consequences. Physicians described navigating a tension between appropriate prescribing, maintaining good relationships with families and staff (who often advocated for antibiotic use), considering resident wishes regarding receipt of treatment, and applying comfort measures during end of life care. Most physicians felt it was more important to avoid the negative consequences of inappropriate prescribing (Beliefs about consequences) than the potential negative consequences of not following the pressure from staff and family to prescribe (Social influence), although participants reported occasionally succumbing to the pressure.

When a nurse calls with a lab report of a positive urine culture they’re expecting me to order a prescription, to order an antibiotic to treat it and if I determine that isn’t required, sometimes they don’t want to believe me. They try to convince me, but I don’t—I stick to my guns. 006 (medical director)

Physicians typically felt capable (Belief about capabilities) of appropriately initiating an antibiotic prescription, however, a lack of access to diagnostic resources (Environmental context and resources) made it more challenging to determine whether an infection was viral or bacterial. Furthermore, poor continuity of care or a lack of access to relevant information impeded the ability to make an informed decision, thereby reducing confidence in prescribing decisions.

I’m literally on call from eight nursing homes over a weekend, so it’s sometimes physically impossible to go see all the patients I’m being called about; so those physically not always seeing the patient and as well having physicians not familiar with the patients, those lead to I think sometimes inappropriate prescribing. 007

**Educator**

Some physicians saw it as part of their role to be an Educator, by informing and training other staff to improve patient care, and thus decreasing the pressure physicians felt from staff to prescribe. Physicians also reported pressure from families and residents, which they felt could be mitigated through education provided by either themselves or the staff. Many physicians had standard language they used with families to help reframe prescribing decisions as a careful use of antibiotics to avoid unnecessary harms. Many challenges to education for staff and families were expressed, including contextual factors such as high staff turnover and lack of time for education (Environmental context and resources).

The one [spiel] with the family is just a reminder honestly about antibiotic resistance and about their need to make sure that when they really do need antibiotic that they work, ... so just explain to them the importance of making sure we’re using antibiotics judiciously. 007

Beliefs about consequences amplified the Educator role, with these physicians believing educating their colleagues would have a positive impact on resident care and antibiotic prescribing. Physicians who did not see their role as an Educator still felt education of staff and families was important but did not see it as their role to deliver that education. When educating families, physicians with the
### Table 2  Connecting Social/Professional role and identity to initiation and duration, and how they are considered within the Ontario Health (Quality) report

<table>
<thead>
<tr>
<th>Behaviours</th>
<th>Social/Professional role and identity</th>
<th>Role of the report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decreasing the initiation of antibiotic prescriptions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'I'm looking at treating the patient and not the lab test.' 006 (medical director)</td>
<td>'They (conversations with patients and families) seem to go well and it's better than not having them because families feel more involved and keeping in the loop ... There's lots of room for families to input. Not just for the nurses, but with me and a nurse practitioner.' 010 (medical director)</td>
</tr>
<tr>
<td></td>
<td>'I always worry though that when you have a frail elderly patient who's coughing and you can hear it's deep in their chest and they not eating and drinking well, that if you don't treat them you will, and they had pneumonia, the chance is that they're not going to do well. ... I don't think I can, not treat them.' 004 (medical director)</td>
<td>'My impression has been that very little works. If I explain to one nurse the reason why I'm not prescribing an antibiotic, I may get a call the next day from somebody else with the same thing. ... Education has to be ongoing and a lot of times it isn’t.' 006 (medical director)</td>
</tr>
<tr>
<td></td>
<td>'My job is to be there and treat the patient and their family and not to just write the prescription easily because it would have been a lot faster honestly to just say, 'Fine here's another 3 days or 7 days or whatever', but that wasn't the appropriate thing to do.' 007</td>
<td>(Education seemed to focus more on initiation, and more about an individual physician increasing their own knowledge, less about the duration knowledge of others).</td>
</tr>
<tr>
<td><strong>Decreasing the duration of antibiotic prescriptions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>'Most physicians only show up once a week, shortening the course of the antibiotic treatment for 2 days, you’re not going to possibly even remember to do that, unless you have the staff onboard to do it ... To help you do that.' 001 (medical director)</td>
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</tr>
</tbody>
</table>

Physicians did not think the report would have much impact on their antibiotic initiation. They were already aware of the need to decrease initiation.
Educator role saw the beneficial effects of taking the time to speak with them, further reinforcing their role. They [conversations with patients and families] seem to go well and it’s better than not having them because families feel more involved and keeping in the loop… There’s lots of room for families to input. Not just for the nurses, but with me and a nurse practitioner. 010 (medical director)

Change driver
The few physicians who were Change drivers saw it as their role to initiate systematic changes in the facility to decrease inappropriate initiation and longer duration of antibiotics. This role was most apparent when discussing the need to decrease use of routine urine testing for urinary tract infections. These physicians would typically involve other staff, such as having pharmacists send reminders about decreasing the duration of some antibiotics. Another physician described using the OH(Q) report as a teaching tool and felt it was their role to educate other providers and change facility practices. It is important to note that not all Change drivers held the position of medical director.

As a medical director I was in a position where I was able to tell them [staff] what I wanted them to do. Whereas, as an attending physician, I’m not really, I’m not as able to do that or a physician might not feel as empowered to change something. But the medical director does have to go to these meetings with the management team and so, then having this can be helpful for them to offer those change ideas. 011 (medical director)

Belief about consequence interacted with the Change driver role as some physicians also saw the benefit of changing facility level practices on patients and preventing general antimicrobial resistance, which motivated them to act as a Change driver in their home(s).

I’m seeing the consequences of, the downside of antibiotics. So, I think it’s important that we use them wisely. I think that’s what made me a [antibiotic] champion. 004 (medical director)

Change drivers leveraged Social influence by using a team approach, such that the positive attitudes and team collaboration were needed in order to make facility level changes. It was also reported that the team approach was needed for appropriate prescribing in this type of care setting, given that the physician was not in the facility often and thus relied on the team to monitor and report appropriate signs and symptoms (Environmental context and resources). Trust in the staff to know the patient and recognize the right factors played an important role in their ability to be a Change driver and Appropriate prescriber.

If I don’t feel I can trust my nursing staff to be aware of symptoms or to be able to recognize when things change quickly, then I feel again that I’m more likely to prescribe just because I’m a little bit more worried that things will get missed. 017

Impact of the OH(Q) MyPractice: Long-term Care report
How physicians responded to data regarding their prescribing practices could be understood by examining how the report interacted with each role in terms of Reinforcing behaviour and generating Intention. Physicians who identified as an Appropriate prescriber were interested in understanding their own prescribing and working towards individual improvement. Educators and Change drivers went beyond individual improvement in an attempt to influence the prescribing practices of others, including attention to organisational processes. Additional features of the impact of the report on antibiotic initiation and duration are included in table 2.

Reinforcement
To understand their own prescribing and increase the probability of change, physicians needed to trust the data in the report. Physicians typically trusted the source of the data, although some needed to work through a process first, such as reading through how they came to the numbers, the source of the original data and so on.

The fact that it was independent. You know, data was not being generated by a pharmaceutical company for example. It was a neutral source, that was good. I thought it was reasonably unbiased, so I trusted it. 018 (medical director)

Some physicians saw the report as reinforcement of their individual usual practice as an Appropriate prescriber, and less about how to impact the prescribing of others or the overall home as an Educator or Change driver. For some, this was driven by the belief that they could not impact the prescribing patterns of others.

I do think it’s still helpful to see at the individual level. I think it’s more helpful at the home level for sure because I can only impact on those, I can’t impact prescribing [of] anyone else. 007

The change idea pages were designed to support those who were interested in improving their practice, however, of those that did read that section, most physicians reported they were already familiar with, or already doing, all of those suggestions. The resulting inaction highlighted that the report may be reinforcing the physicians’ beliefs that they were already doing what was needed, even when this may not be the case.

Intention
Overall, physicians’ intentions when understanding themselves as an Appropriate prescriber was to see how they were doing in comparison to others and decide if they needed to change. The comparison to other physicians in the report data did motivate some to change their practice when the numbers did not meet their expectations,
such as when they prescribed higher (worse) than average or were at the average but wanted to do better. The intention for change was generally to ‘do better’ and decrease the initiation and duration of their prescribing, although very few mentioned setting an explicit goal. Furthermore, for those who were at levels they expected, there was little motivation to read the change idea pages or make specific plans for improvement.

Intentions to change the practices of others or facility practices as an Educator or Change driver were typically non-specific as well, unless they related to urinary tract infections which had specific intentions.

Team goals would be to understand better what the diagnosis of urinary tract infection looks like in that the frail, elderly and the dementia population and to understand the risks of overtreatment of—overuse of antibiotics. 016 (medical director)

Social influence

Social comparisons led to intentions to improve as described above. However, physicians rarely had the opportunity to speak to others about their data. One medical director even asked: ‘Who am I going to discuss it (the report) with?’ 008 (medical director). Some Educators with an interest in discussing and sharing the report had plans to speak to others but had not done so yet, even though most had been receiving the report for several years. One physician (non-medical director) described sharing the data and using the report as a teaching tool with new practitioners, thus filling their role as an Educator and Change driver.

DISCUSSION

This study highlights the perceived Professional role and identity of nursing home physicians as a significant driver of antibiotic prescribing and clinical decision making in this setting. All physicians saw themselves as Appropriate prescribers, while only some physicians also saw themselves as Educators or Change drivers. Lack of time, high staff turnover, lack of access to diagnostic equipment, and provision of care to several homes at one time leading to a high number of residents to care for and teams to work with (Environmental context and resources), made it challenging for physicians to fill all roles. Even among those who were motivated to improve their prescribing, few had the capabilities and opportunities needed to work with team members to achieve this practice change in a sustainable way. While the A&F report supported physicians to understand their own prescribing practices, it did not appear to reinforce behaviour change, suggesting that A&F may provide more benefit when applied with other strategies.

Antibiotic prescribing in nursing homes has been shown to be driven by prescriber factors rather than infection prevalence or antimicrobial stewardship initiatives. This aligns with our findings that what physicians believe (ie, their perceived Professional role, Beliefs about capabilities and Beliefs about consequences) drive their antibiotic prescribing behaviour. Suggested strategies to address prescriber factors have included goal setting, education, and A&F.25 When asked about changing their prescribing practices, few of the interviewed physician mentioned setting goals or any perceived benefit of goal setting. Education for staff and patients was suggested by many physicians, however, they did not necessarily see the benefit of further education for themselves. This is consistent with the results indicating there did not appear to be a Knowledge or Skills gap regarding initiation of antibiotics.

Our findings also suggest the A&F report did not reinforce behaviour change, indicating that A&F may not be effective as a standalone strategy when prescriber beliefs are such a strong determinant and Environmental context and resources has such a strong negative impact. Our results are consistent with the evidence for moving beyond education and individual interventions to explicitly address team functioning and communication,26 27 as well as system-level changes, such as optimising staffing models. When a team approach is used in combination with system-level changes, it may allow physicians to fulfil their clinical and professional role and support improved antibiotic prescribing. Developing a culture where data are collected and shared openly among colleagues, including administrators, may be more amenable to quality improvement.27 28 However, future studies are needed to understand how to enable this culture in nursing homes. Suggestions were also made to have physician reports shared with the care home manager, however, to protect physician privacy, this would be at the discretion of the physician rather than having OH(Q) share the report directly with the manager.

Physicians need, and in theory are trained, to be communicators, collaborators, leaders, health advocates, scholars, and professionals, as outlined in the CanMEDS framework.29 Many physicians in our study did not perceive themselves as having a role as an Educator or Change driver, highlighting a gap in the realisation of the full complement of CanMEDS roles in practice. Programmes such as TeamSTEPPS 2.0 (Team Strategies and Tools to Enhance Performance and Patient Safety) for Long Term Care include evidence based strategies to improve collaboration and communication within nursing homes.30 31 32 For example, one study found the effective implementation of SBAR (Situation, Background, Analysis and Recommendation), a communication format to promote a structured conversation between nurses and physicians, decreased the odds of a prescription being written for asymptomatic bacteriuria.34 These communication strategies have been shown to improve team leadership, communication, situational monitoring, mutual support and overall teamwork,30 and align with the skills needed by physician to fulfil their roles.
Implications for interventions to reduce antibiotic prescribing

Our findings echo those of similar initiatives to influence prescribing in nursing homes, particularly regarding the impact of team functioning on prescribing. Physician prescribers in this setting must move from ‘letting it happen’ to ‘making it happen’. To achieve this shift, the use of the TDF in this study provides an opportunity to map the key drivers of behaviour to Behaviour Change Techniques (BCTs), informing an evidence-based intervention to improve antibiotic prescribing that is tailored to the problem at hand. For example, increased opportunity for communication between nursing home physicians with similar resident populations across Ontario may encourage more Social influence, as physicians in our study mentioned minimal opportunity to discuss their values or practice with others. Implementation of communication strategies, such as those mentioned above, may also impact Social influence and Belief about capabilities if physicians are able to effectively communicate with staff and thus decrease the perceived pressure to prescribe. Interventions addressing Knowledge and Skills may also be helpful for improving (reducing) antibiotic prescribing durations, but less so for antibiotic initiation. Interventions that focus on Professional role, such as training on effective communication or how to educate others, may be more applicable in this setting, however, are difficult to enact without system-level change when lack of time and high staff turnover remain significant barriers to an effective team approach.

Limitations

As interviews were only conducted with nursing home physicians who engaged with the OH(Q) report and agreed to participate, results may not be transferable to all nursing home physicians, nor to other A&F reports. The antibiotic prescribing patterns of the participants was unknown by the authors, which means comparison between those that were and were not meeting recommendations was not possible. This lack of comparison also means that when physicians perceive their role as an Appropriate prescriber this does not necessarily mean the physician is meeting recommendations.

As perceived Appropriate prescribers, many of those who felt they should improve their prescribing practice after reading the report, either because they were close to or worse than average, felt they were already following the suggested change ideas mentioned in the report. It is unclear to what extent the physicians were already doing those activities, however, this perceived disconnection between needing to change and already following the change ideas may have reinforced their current prescribing behaviour.

As interviews were part of a process evaluation exploring the impact of the physician-directed A&F reports on nursing home physicians, interviews with other providers, staff and residents were not possible, yet would have provided a more comprehensive view. Physicians were from several types of home (for-profit, not for-profit and so on) and locations (urban, rural and so on). Suggestions were made regarding potential difference between homes; however, this could not be confirmed in the analysis. Analysis from the FIRST AID-LTC trial will show if there is quantitative impact of the report on antibiotic prescribing over time and between those who did and did not receive the report, and if there are factors correlated to prescribing, such as type of home. Lack of access to this data before publication limited triangulation of findings.

Conclusion

Improving antibiotic prescribing is a priority to prevent antimicrobial resistance, especially in vulnerable populations such as those living in nursing homes. For physicians to improve their antibiotic prescribing in this setting, they must go beyond a perceived role of Appropriate prescriber and embrace the roles of Educator and Change driver. To achieve this, a focus on teamwork and communication is encouraged. Environmental context and resources had a strong negative impact and may be preventing physicians from fulfilling their roles. This theory-informed understanding of antibiotic prescribing in nursing homes can inform future interventions to support sustainable improvements in practice in this context.

Twitter Celia Laur @Celia_Laur, Laura Desveaux @lauradesveaux and Noah Michael Ivers @NoahIvers

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Contributors CL led this study, including conducting the interviews, analysis and writing the manuscript. TS was the second coder in the analysis and contributed to development of themes. MS assisted with recruitment, overall coordination and development of themes. LD provided input to initial study conception, verify themes and finalising the manuscript. ND leads the FIRST-AID trial and was involved in initial study conception and final Interpretation. CM and JL represent Ontario Health, which develops and sends the reports, and were involved in recruitment and verifying themes. NMI provided senior oversight during data collection, analysis, theme development and writing.

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REFERENCES

MyPractice
Long-Term Care

A tailored report for quality care

Dr. Sample Physician
LHIN: Sample Lhin
Reporting Period: Mar 31, 2018

Endorsed by:

Health Quality Ontario
Let's make our health system healthier

Ontario Long Term Care Clinicians
What percentage of my residents were prescribed an antibiotic?

Between Jan 01, 2018 and Mar 31, 2018:
- **26.7%** of my residents were prescribed an antibiotic.¹⁻²
- My overall prescribing rate is lower than the provincial rate of **28%**. The rate in my LHIN is **40%**.¹⁻²

Key Change:
Don’t do a urine dip or urine culture unless there are clear signs and symptoms of a urinary tract infection (UTI).³⁻⁴

Exclusions: Antibiotic creams or ointments, otic or ophthalmic antibiotics.
Inclusions: Residents who are palliative, aged 19 and older, or new to the home.

†Data suppressed as per ICES’ privacy policy (e.g. number of residents between 1 and 5). Gaps in graph are due to suppression.
In my LTC homes, what percentage of my residents were prescribed an antibiotic?

- 3 homes were identified from my OHIP claims in which I provide care for at least six residents.
- Between Jan 01, 2018 and Mar 31, 2018, my antibiotic prescribing rates were:

  1. Sample Home A: 32.7% (17/52)
  2. Sample Home B: 22.9% (11/48)
  3. Sample Home C: 22.9% (8/35)

---

**Key Change:**
Don’t do a urine dip or urine culture unless there are clear signs and symptoms of a urinary tract infection (UTI).³⁻⁴

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†Data suppressed as per ICES’ privacy policy (e.g. number of residents between 1 and 5), additional suppression may be applied to prevent calculation of suppressed data.

**Exclusions:** Antibiotic creams, otic or ophthalmic antibiotics.
**Inclusions:** Residents who are palliative, aged 19 and older, or new to the home.

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For more suggestions for improvement, see Change Ideas: Antibiotic prescribing.
Change Ideas for Quality Improvement: Antibiotic prescribing

Steps I can take to change my antibiotic prescribing

Avoid Treatment of Asymptomatic Bacteriuria

1) Don’t do a urine dip or urine culture unless there are clear signs and symptoms of a urinary tract infection (UTI).

Common situations where systemic antibiotics are generally not indicated:
- Positive urine culture in an asymptomatic resident.
- Urine culture ordered solely because of change in urine appearance (e.g., cloudy) or odor.
- Nonspecific symptoms or signs not referable to the urinary tract, such as falls or mental status change (with or without a positive urine culture).
- For additional guidance, use the Public Health Ontario’s UTI Program assessment algorithm.

2) Prescribe antibiotics only when resident has clear signs and symptoms of UTI and reassess once urine culture and susceptibility results have been received.

Review/Establish Criteria or Guidelines for Treatment of Infections

3) Review other common indications where antibiotics are not required in LTC residents.
- Upper respiratory infection (common cold).
- Bronchitis or asthma in a resident who does not have COPD.
- “Infiltrate” on chest x-ray in the absence of clinically significant symptoms.
- Suspected or proven influenza in the absence of a secondary infection (but DO treat influenza with antivirals).
- Skin wound without cellulitis, sepsis, or osteomyelitis (regardless of culture result).

Educate residents, families, clinicians and other staff

4) Use the SymptomFreeLetItBe handout when talking with residents, families and staff.

Suggested Tools and Resources

- Choosing Wisely Canada, Using Antibiotics Wisely Campaign
- AHRQ. 12 Common Nursing Home Situations In Which Systemic Antibiotics are Generally Not Indicated
- AMMI Asymptomatic Bacteriuria Toolkit. Fillable resident/family letter
- Public Health Ontario. UTI Program: Assessment algorithm for urinary tract infections (UTIs) in medically stable non-catheterized residents
### MyPractice: Long-Term Care

#### Change Ideas for Quality Improvement: Antibiotic prescribing

### Steps I can take with the long term care home to optimize antibiotic prescribing

| Avoid Treatment of Asymptomatic Bacteriuria | Implement a program to reduce unnecessary urine culturing.  
Standardize guidelines of how and when to test cultures and interpretation of urine culture results.  
*Discontinue routine annual urine screening and screening at admission if residents do not have indicated clinical signs and symptoms of a UTI.*  
Refer to [Public Health Ontario’s UTI Program](#). |
|-------------------------------------------------|
Implement structured nursing communication tools (e.g. SBAR tools) to aid in clear communication between nurses and prescribers and standardize assessments of residents suspected with infection. |
| Educate residents, families, clinicians and other staff | Provide education and resources for prescribers, nurses, front-line clinicians and on-call staff about common infections, and the importance of appropriate antibiotic use. Include a consistent message regarding antimicrobial resistance and role of antibiotics. Refer to [AMMI Asymptomatic Bacteriuria Toolkit, Myths and Truths about Urinary Tract Infections in Long Term Care Residents](#).  
Provide education and resources for residents and families about common infections, antibiotic resistance, and improving antibiotic use. Refer to [AMMI Asymptomatic Bacteriuria Toolkit, Fillable resident/family letter](#) or [DBND FAQ for Families, Guardians and Health Care Aides-UTI in LTCF](#). |
| Evaluate opportunities for Antimicrobial Stewardship | • Public Health Ontario has developed a [primer](#) and [checklist](#) to identify gaps and provide helpful tools for implementation. |
What percentage of my antibiotic treatments were longer than seven days?

Between Jan 01, 2018 and Mar 31, 2018:

- 9.6% of my antibiotic treatments were longer than seven days.
- My rate is lower than the provincial rate at the 25th percentile (12.7%). The rate in my LHIN is 30%.

![Graph showing antibiotic treatment percentages over time]

Key Change:
Optimize duration of therapy to 7 days or less for uncomplicated cystitis, pneumonia and cellulitis.⁵

For more suggestions for improvement, see Change Ideas: Antibiotic prescribing.
**MyPractice: Long-Term Care**

**Antibiotic prolonged treatment (>7 days) in my LTC homes**

In my LTC homes, what percentage of my antibiotic treatments were longer than seven days?

- 3 homes were identified from my OHIP claims in which I provide care for at least six residents.
- Between Jan 01, 2018 and Mar 31, 2018, my rates of antibiotic prolonged treatment (>7 days) were:

  1. Sample Home A: 13.5%
  2. Sample Home B: 12.5%
  3. Sample Home C: 0.0%

---

**Key Change:**
Optimize duration of therapy to 7 days or less for uncomplicated cystitis, pneumonia and cellulitis.⁵

---

**Exclusions:** Antibiotic creams or ointments, otic or ophthalmic antibiotics.

**Inclusions:** Residents who are palliative, aged 19 and older, or new to the home.

†Data suppressed as per ICES' privacy policy (e.g. number of residents between 1 and 5), additional suppression may be applied to prevent calculation of suppressed data.

For more suggestions for improvement, see Change Ideas: Antibiotic prescribing.
**Steps I can take to change my antibiotic treatment durations**

Prescribe shorter courses when appropriate.

Optimize duration of therapy to **7 days or less** for uncomplicated cystitis, pneumonia and cellulitis.

In most cases of uncomplicated infections seen in LTC, short courses of antibiotics are equally effective and result in lower risk of harm.²

<table>
<thead>
<tr>
<th>Uncomplicated Infection</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncomplicated cystitis</td>
<td>≤ 7 days</td>
</tr>
<tr>
<td>Uncomplicated pneumonia</td>
<td>5-7 days</td>
</tr>
<tr>
<td>Uncomplicated cellulitis</td>
<td>5-7 days</td>
</tr>
</tbody>
</table>

Suggested Tools and Resources

Infographic on **Shorter is Smarter: Reducing duration of antibiotic therapy in long-term care**.
Prescribe shorter courses when appropriate.

Implement guidelines or resources to reduce antibiotic exposure for specific infections to the shortest effective duration. Refer to Fact Sheet and Evidence Briefs on Shorter is Smarter: Reducing Duration of Antibiotic Treatment for Common Infections in Long-term Care.

- Uncomplicated cystitis: ≤ 7 days
- Uncomplicated pneumonia: 5-7 days
- Uncomplicated cellulitis: 5-7 days

Collaborate with pharmacists to ensure appropriate duration is selected for each infection.

Systematically re-evaluate duration of antibiotic therapy

Reassess resident status, laboratory cultures, and duration of therapy.

Discontinue antibiotic where appropriate.

Narrow spectrum of antibiotic therapy where appropriate: de-escalate or streamline.

Steps I can take working with the long term care home to optimize antibiotic duration
Improving Antibiotic Initiation and Duration in Long Term Care: A Process Evaluation of an Audit and Feedback Intervention

Interview Guide

Version 2.0
Date: March 2019
1. **Title**
   Improving Antibiotic Initiation and Duration in Long Term Care: A Process Evaluation of an Audit and Feedback Intervention

2. **Interview Guide Version**
   Version 2.0, March 20, 2019

3. **Roles and responsibilities**
   **Principle Investigator:** Noah Ivers, Women’s College Hospital, Women’s College Research Institute, and University of Toronto
   **Project Lead:** Celia Laur, Women’s College Hospital, Women’s College Research Institute
   **Project Coordinator:** Michelle Simeoni, Women’s College Hospital, Women’s College Research Institute

   **Investigators:**
   Laura Desveaux, Women’s College Hospital, Women’s College Research Institute, and University of Toronto
   Nick Daneman, Sunnybrook Health Sciences Centre, Sunnybrook Research Institute, and University of Toronto
INTERVIEW GUIDE

Welcome/Introductions

Thank you for agreeing to participate in this discussion about your Health Quality Ontario feedback reports. Is this still a convenient time to talk?

If No: Are you still interested in participating in this study?
   Yes: Is there a better time we can arrange? [arrange new time/tell Michelle]
   No: Thank you for your time. [End Call]

If Yes: I’m [Name, Credentials, Affiliation]. Together with our research partners at Sunnybrook Health Sciences Centre in Toronto, we are working with Health Quality Ontario to understand how you use the HQO MyPractice: Long-Term Care reports in your practice. Our discussion should take approximately 30-45 minutes. Have you read the information letter and returned the signed consent form we sent?

If Yes: Thank you. Just as a reminder, our discussion will be audio-recorded but all of the transcripts will be anonymized so that your responses cannot be traced back to you, and the results will be published in aggregate form only. At any point during the interview, you may choose not to respond to a specific question. If you wish to end our discussion before I have asked all of the questions, or to withdraw from the study at any time during the interview, you are free to do so.

If No: [Complete verbal consent]

ALL: I should also say that I am not a healthcare professional and so I am not here to make any clinical judgments. I am more interested in how you use reports but feel free to give examples from your experience. There are no right or wrong answers.

To start, I have a few demographic questions for you.

[Start recording now]

Interview Guide

1. DEMOGRAPHIC QUESTIONS
   a. What is your self-identified gender?
   b. What is your role at the LTC facility?
   c. How many years have you been practicing?
   d. How many years have you been working in LTC?
   e. In how many LTC facilities do you currently work?
      a. If only one, how many years have you worked in that facility?
b. If more than one, what is the longest amount of time that you have worked in one facility?
f. Are the facilities you work in:
   a. For profit, not for profit, municipal, or charitable?
   b. More urban or rural?
   c. Approximately how many residents are in each facility?
g. Do you work in any other setting (primary care)?
   a. If so, how much time do you spend in each setting?
h. Have you been involved in other projects with HQO (i.e. helping design the reports)? If so, what was your involvement?

2. There are a lot of competing priorities for you as a physician working in LTC? What are some of those priorities that come to mind first?
   a. If antibiotics not mentioned: With all of these other priorities, do you think decrease your antibiotic prescribing is important? Why?

   a. If 1 LTC facility: Are there any differences that you notice within team members that impact antibiotic prescribing practices in your facility?

4. Did you receive an e-mail from Health Quality Ontario that had a pdf report as an attachment that could be download from your e-mail? Or did you sign into a website to see a new interactive report online?

5. Is this the first MyPractice: Long-Term Care report you have received from Health Quality Ontario?
   a. If NO: Approximately how many others have you received? Prompt: When did you sign up?
   b. BOTH: What are your overall views about the HQO Long-Term Care Practice Report? Prompts: ease of use; clarity; ability to apply to your practice; like best? not working?

6. Can you walk me through what you did after you received the report? Prompt: save for later? Skim through?
   a. Did you reflect on any of the results after reading?

7. How have you used this report? Prompt: Changed practice? Set goal?

   If NOT FIRST + Dynamic report?
   a. How would you compare the version you received this time to what you received in the past (the pdf)? Prompt: better? Missing from the old one?
b. How have you used this report? Prompt: Changed practice? Set goal?

8. Did you set (or adapt?) any of your own goals about your antibiotic prescribing practices after reading the report? Prompt: initiation? Duration?

If YES
   a. How do you plan to achieve it?
   b. Did you set (or adapt?) any of your own goals about antibiotic initiation? Prompt: *initial prescribing of antibiotics to a patient*
   c. Did you set (or adapt?) any of your own goals about antibiotic treatment length (duration)? Prompt: *patients with prolonged treatment*
   d. Does the HQO report have a role in setting and/or achieving your goals? How? Prompt: comparison to other providers?
   e. **IF MORE THAN ONE LTC PRACTICE:** Do you plan to apply these differently across your long term care practices? How?

If NO,
   f. Did you make a conscious decision to not set a goal or did something interfere with your ability to set a goal?
   g. If you were to set a goal, what would it be? How would you achieve it?
   h. How would you set a goal about antibiotic initiation?
   i. How would you set a goal about antibiotic treatment length (duration/prolonged treatment)?
   j. Would the HQO report have a role in setting and/or achieving your goals? How? Prompt: comparison to other providers?

9. Did you read any of the “Change Ideas” for antibiotics? (*Static:* listed on a few pages; *Dynamic:* listed on the side) *Example:* Optimizing my Antibiotic Prescribing; i.e. educating residents, clinicians, and families

   If YES:
      a. What did you think about these suggestions? Prompt: Feasible? Realistic? Relevant to your practice?
      b. Have you tried any of those ideas in your practice?
         If YES:
            i. Can you talk me through what you did and how it went? Prompt: What worked well? Barriers?

   If NO:
      a. Can you talk me through how you *could* apply one of the ideas in your practice or how they could be modified to improve their utility? Prompt: barriers and facilitators

      c. Change ideas were separated into “Things I can do myself” and “Things my team can do”. What do you think about the use of this distinction?
         i. Did you try any of the ideas? Which one(s)?
a. If YES: Can you talk me through what you did and how it went? Prompt: Worked well? Barriers?

b. If NO: Can you talk me through how you could apply one of the ideas in your practice? Prompt: Barrier and facilitators?
d. Some “Change Ideas” were separated into “prescribing” (initiation) and “prolonged treatment”. What do you think about the use of this distinction? Why? Does it help?

If NO, not use/remember Change ideas: Change ideas are listed on a few page [STATIC] or along the side [DYNAMIC] Example: Optimizing my Antibiotic Prescribing; i.e. educating residents, clinicians, and families

a. Can you talk me through how you could apply one of the ideas to your practice? Prompt: barriers (other prescribers, admin pressure etc.) and facilitators?
   a. Would you consider actually making this change in practice? Why/why not?
   b. Some “Change Ideas” were “Things I can do myself” and “Things my team can do”. What do you think about this distinction?
   c. Some “Change Ideas” were separated into “prescribing” (initiation) and “prolonged treatment”. What do you think about the use of this distinction?
   d. Can you talk me through how you could apply one of the ideas to your practice? Prompt: idea from prescribing/initiation or from prolonged treatment/treatment duration

10. DYNAMIC ONLY for #9
Did you read any of the “Important Questions” (Located in the dropdown box near the bottom of the report) Example: How do I know these data are accurate?
a. If YES:
   a. What do you think about the questions and responses/rebuttals? Prompt: Are they questions you had? Are any missing?
   b. Did reading any of these responses change how you think about the report? Prompt: trust in the data?

b. If NO:
   i. Why not?
   ii. What would you like to see in those Important Questions?

11. In the report, your results are displayed in comparison to other LTC physicians - can you walk me through your reactions to this comparison?
a. Do you think you will change any of your practices after seeing this comparison? How?
   b. In your opinion, what would be an ideal comparator?
   c. Did you check the data and where it came from? Prompt: credible source; accuracy of the database; lack of adjusting based on patient case mix;
      a. What did you look for when doing that check? Prompt: references etc.
12. Have you discussed the report with anyone? Prompt: pharmacist; other physicians
   a. If YES:
      a. Can you talk me through how that conversation went? Prompt: Who was it with? Why that person? Was it useful?
      b. Would you engage in discussions about the report again? Prompt: With the same person? With someone else?
      c. Have you discussed the report with other members of your facility as a group? If so, how did it go? If not, why not?
   b. If NO (TO ANYONE OR GROUP):
      a. Why not? Prompt: Barriers
      b. What would encourage you to discuss your report with others? Prompt: an individual or a group?

13. Can you think of any ways prescribing of antibiotics could be improved within LTC in general? Prompt: any good (or bad) strategies you've seen. Why?

14. Do you have any other thoughts about the HQO practice report or antibiotic prescribing in general which have not been addressed?

Thank you! Those are all the questions I have for you today.

Stop Recording

MEMBER CHECKING: Would you be willing to help make sure that we have understood your responses? If so, in a few months we will send you a summary of what we found so far and request that you comment on whether it resonates with your experience? Is this ok? Is the current e-mail address we have ok?

Thank you!