

Antimicrobial Stewardship Essentials in Long-Term Care

Antimicrobial Stewardship as Quality Improvement



Primer
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Public Health Ontario

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Executive Summary

Antibiotic overuse is contributing to increasing rates of antimicrobial resistance. Antimicrobial stewardship programs (ASPs) have been developed to address this significant public health concern. Residents of long-term care homes are at increased risk of harm from inappropriate antibiotic use. Antimicrobial stewardship in long-term care (LTC) involves changing the way prescribers, nurses and residents think in regards to the use of antibiotics.

For successful ASPs, four key components have been identified: leadership, interventions, monitoring and evaluation and future research.

This primer is meant to guide directors of care, medical directors, prescribers, quality improvement specialists and antimicrobial stewardship champions in planning or expanding an ASP in LTC. Approaching antimicrobial stewardship as an evidence-based quality improvement initiative promotes the judicious use of antibiotics to improve quality of care and support safety of LTC residents. This guide will highlight the four key components of a successful ASP and the evidence to date for ASP strategies in LTC within a quality improvement framework. Practical change ideas and examples can be found in Public Health Ontario's [Antimicrobial Stewardship Essentials Checklist in Long-Term Care](#).

Quality Improvement Steps for Antimicrobial Stewardship in LTC

Step 1: Forming the team. A comprehensive ASP team should include strong leadership, a resourceful program lead, supportive medical and nursing leads, and pharmacy and infection prevention and control expertise.

Step 2: Setting aims. Appropriate antibiotic use criteria and guidelines should be established for common infections encountered in LTC.

Step 3: Selecting changes. Antimicrobial stewardship strategies that have been shown to improve antibiotic use should be reviewed and analysed for feasibility within the home. Selected changes for implementation can include strategies to prevent unnecessary antibiotic starts, improve details of antibiotic prescribing and encourage timely review of prescribed antibiotics.

Step 4: Establishing measures. Program measures and clinical outcomes should be monitored with changes to antibiotic use. Measures may include process adherence, antibiotic starts and antibiotic days of therapy.

Step 5: Testing and sustaining changes. Changes should be tested through plan-do-study-act (PDSA) cycles and updated with new research when appropriate. Changes should be sustained through continuous quality improvement and feedback to ensure a successful and robust ASP.

Antimicrobial Stewardship in Long-Term Care

The rise of antimicrobial resistance across the globe has resulted in the need for antimicrobial stewardship. While there is much research on antimicrobial stewardship in hospitals, it is recognized that antimicrobial use needs to be addressed in non-acute care settings as well.¹ Overuse of antibiotics, particularly in the elderly, has been associated with an increased risk of harm.² These harms include increased risk of adverse drug events, *Clostridium difficile* infection (CDI) and infection with antimicrobial-resistant organisms (AROs).³ Infections with AROs in long-term care (LTC) residents are also associated with more severe infection, hospitalization, increased risk of death and increased cost of care.⁴

Long-term care residents present unique challenges to antimicrobial stewardship. Symptoms of infection may be atypical, cognitive impairment limits communication of symptoms, and risks for acquisition of resistant organisms are increased due to aging immune systems, complex comorbidities and frequent hospitalizations.⁵ Increased antibiotic use in long term-care homes (LTCHs) has also been attributed to limited resources to diagnose infections, lower staff-to-resident ratios and increased dependence on diagnostic tests, such as urinalyses or chest radiographs for suspected infections.⁶

Antimicrobial stewards promote the judicious use of antibiotics to optimize clinical outcomes, limit development of AROs, and preserve the efficacy of antibiotics for future generations. Formal antimicrobial stewardship programs (ASPs) have been shown to be effective and safe in reducing unnecessary antimicrobial use by implementing “coordinated interventions designed to improve and measure the appropriate use of antimicrobial agents.”⁷

Four key components of successful ASPs have been identified and described by the Canadian Communicable and Infectious Disease Steering Committee (CIDSC), under the Pan-Canadian Public Health Network including leadership, interventions, monitoring and evaluation, and future research.¹

In practice, implementing and sustaining these key ASP components in LTC requires organizational commitment and strategy with goal setting, outcome measurement and continuous quality improvement.⁶

Quality Improvement (QI) is a proven effective method to improve patient care and safety.⁸ This primer will highlight the key components of ASPs identified by the CIDSC and the evidence to date for ASP strategies in LTC, within a QI framework. Five QI steps will be discussed in the context of antimicrobial stewardship in LTC (see [Figure 1](#)).

Step 1: Forming the team

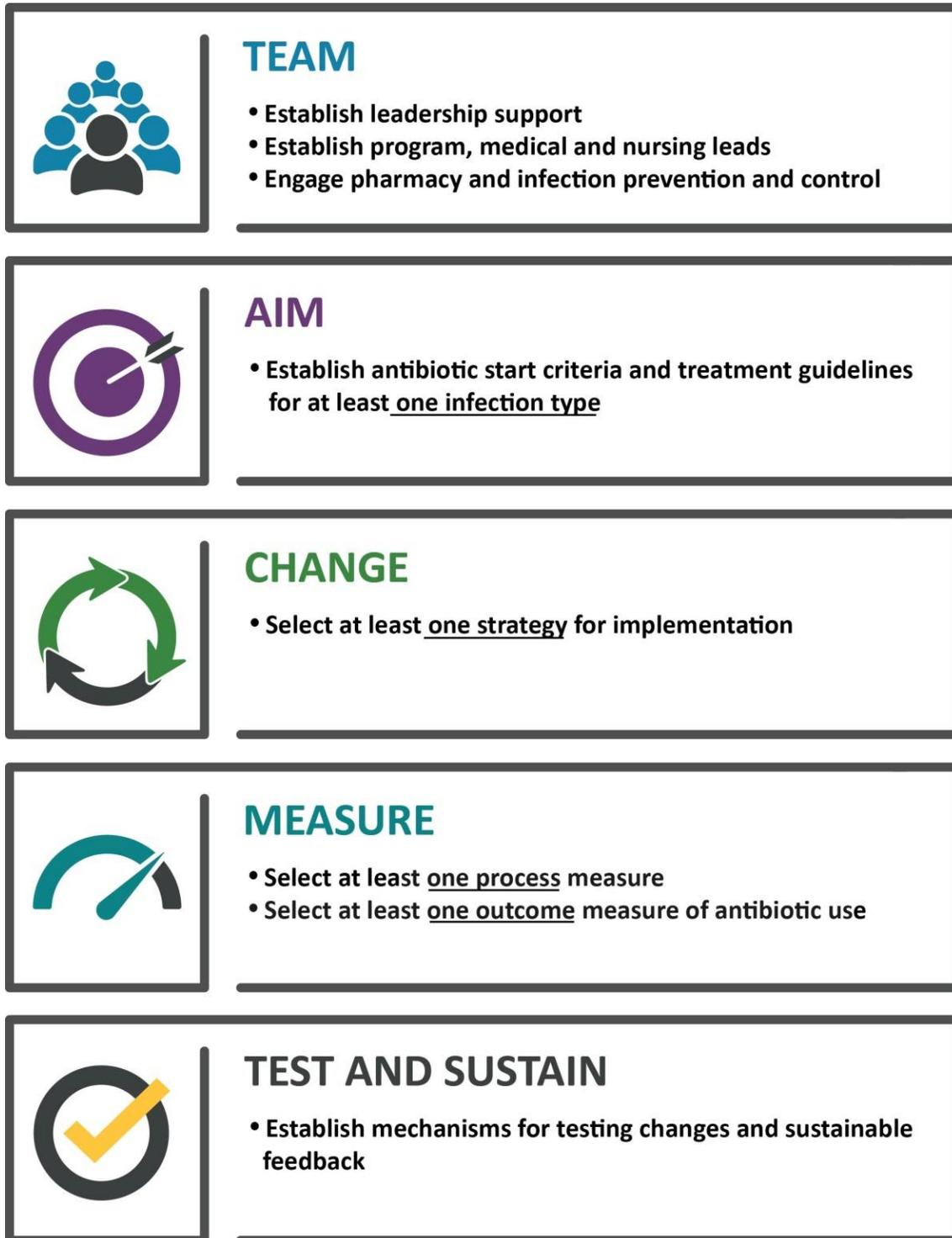
Step 2: Setting aims

Step 3: Selecting changes

Step 4: Establishing measures

Step 5: Testing and sustaining changes

Figure 1. Quality Improvement Steps for Antimicrobial Stewardship in LTC



Step 1: Forming the Team

Whose Expertise Do We Need?

ASPs have traditionally been driven by infectious disease specialists and pharmacists – expertise that may not be readily available to most LTCHs. It is more practical in LTC to identify key persons in a team who can impact antibiotic use and drive stewardship in LTC. This team will play an important role in selecting champions, establishing buy-in, motivating change and introducing new perspectives on antibiotic use.

Key ASP Component: Leadership

“Successful stewardship undertakings are grounded in accountability, appropriate and sustained resources and expertise, adequate support and training and involve specialists in an interdisciplinary manner.”¹

Senior management lead. Senior leadership, including directors of care or corporate consultants, must be on board to ensure accountability, advocate for sustainable human and financial resources, facilitate acquisition of expertise, and support ongoing training in antimicrobial stewardship initiatives.^{1,9} Actions to support program development should include monitoring program performance, designating stewardship priorities to lead medical, nursing and pharmacy roles, and allocating dedicated resources to these priorities.³

Program lead. Due to competing priorities and limited resources, ASPs in LTC may benefit from identifying a program lead to support program priorities. Potential program leads may be a quality improvement specialist, project coordinator, or clinician lead with interest in antimicrobial stewardship. Program leads should be able to facilitate a multidisciplinary team, and partnerships with external expertise in addressing the multiple facets of antibiotic use. Responsibilities should also include monitoring program development, coordinating program measures and stewardship initiatives with input from the team.

Medical lead. The medical lead should be in a position to support or authorize the adoption or development of standards for antibiotic prescribing within the home. Potential medical leads in LTC may include the medical director, nurse practitioner or a physician champion with an interest in antimicrobial stewardship. This person should understand the clinical impact of proposed changes in antibiotic use and possible consequences in other parts of the system.^{3,9} Responsibilities should include reviewing antibiotic use data and reinforcing efforts to standardize antibiotic starts and prescribing.

Nursing lead. It is important that the nursing lead have the ability to address practices for nurses and clinical front-line staff, including registered practical nurses (RPN) and personal support workers (PSW). Antibiotic starts can be significantly influenced by how nurses communicate a resident’s symptoms or how they perceive the benefits of antibiotics.^{10,11} Responsibilities should include reinforcing nursing efforts to standardize assessments of infection and documentation, and encourage best practices for prevention of pressure ulcers and aspiration to minimize related complications in residents that often involve the need for antibiotics.^{3,4,9}

Pharmacy expertise. Consultant pharmacists for LTCHs should be included to focus on improving antibiotic use. Their expertise can assist with optimizing selection, dosing and duration in prescribing antibiotics. Pharmacists have also typically supported antimicrobial stewardship in promoting awareness, providing drug expertise and quality assurance, influencing clinician education, performing medication reviews that may target specific antibiotics, assessing appropriateness of antibiotic use or gathering and analysing antibiotic use data.^{3,9}

Infection prevention and control expertise. Infection prevention and control (IPAC) is closely related to antimicrobial stewardship in many aspects. Surveillance of health care-associated infections, CDI and AROs, including methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE), is important to provide insight into a population prone to colonization and infection.¹² Ensuring resources to encourage IPAC best practices and hand hygiene can minimize the risks of such healthcare-associated infections in LTC.

Antimicrobial stewardship expertise or infectious disease consultant. Scarcity of clinical infectious disease expertise has been identified as a significant challenge to appropriate antibiotic use.¹³ LTCHs can consider partnering with ASP leads at local hospitals or engaging consultant pharmacists with ASP experience if support from local infectious disease consultants who can champion antimicrobial stewardship is not available. Local public health units may also be aware of additional stewardship resources or local ASP initiatives. To build internal capacity, prescribers or pharmacists in the home who have an interest in antimicrobial stewardship, should be encouraged to undertake specialized antimicrobial stewardship training courses or certificate programs.³

Step 2: Setting Aims

What Are We Trying to Accomplish?

In order to optimize and reduce unnecessary antibiotic use, everyone in the home should be aware of what is considered appropriate antibiotic use. Residents in LTC may be prescribed antibiotics for a variety of indications, and each infection syndrome has unique challenges to appropriate antibiotic use.

Establish antibiotic start criteria. Setting minimum criteria for antibiotic initiation (e.g. Loeb criteria) has been shown to reduce unnecessary antibiotic exposure when infection is not likely present.^{4,14,15} As a result, many antibiotic stewardship-focused resources and checklists for LTC settings are available for common infections, such as urinary, respiratory or skin and soft tissue infections. This step can begin to set the standard for “appropriate” antibiotic use in the home, especially when implemented into workflows and clinical algorithms for assessing residents.

Establish treatment guidelines. Indication-specific treatment guidelines should be established to guide antibiotic selection, dose, administration route and planned duration of therapy.¹⁶ Each component of the initial prescription is important to optimize antibiotic success, while balancing unnecessary exposure. These guidelines should be easily accessible to staff through pocket guides, posters, templates or through the electronic health record, if possible.

Setting Your Aim

To help focus your initial ASP efforts, you may find it beneficial to start by addressing one of the more **common reasons for antibiotic misuse in LTC** such as:^{17,18}

- Antibiotics for asymptomatic bacteriuria
- Antibiotics for upper respiratory infections or viral infections
- Antibiotics for skin wounds without active infection
- Prolonged durations of antibiotic therapy (greater than seven days) when not needed
- Absence of timely review of antibiotic therapy (within three days)

See PHO’s [Antimicrobial Stewardship Essentials Checklist in Long-Term Care](#) for examples of antibiotic start criteria or treatment guidelines you can use.

Step 3: Selecting Changes

What Change Can We Make that Will Result in an Improvement?

Antibiotic prescribing is a complex process where decisions are made before, during and after the prescription. Multiple factors and subjective influences have been identified and described as barriers or knowledge gaps to appropriate antibiotic use in LTCHs.^{6,18-20} As a result, posting infectious disease guidelines and prescriber education alone is often not sufficient to effect changes in antibiotic use.^{5,6,16} Some barriers may be non-modifiable by ASPs in LTC, such as availability of diagnostic resources, or staff-to-resident ratios. Antimicrobial stewardship as quality improvement involves targeting influences and decisions in antibiotic use that can be modified through knowledge and behaviour changes (see [Figure 2](#)).

ASP Key Component: Interventions

“Effective stewardship interventions are multi-pronged and comprehensive.”¹

Antimicrobial stewardship initiatives in LTC that have demonstrated impact on antibiotic use have often incorporated multiple strategies to address different points in the prescription process (see [Figure 3](#)). There is currently little evidence to support one specific strategy over another at this time. In the acute care setting, there are many evidence-based

ASP strategies to improve antibiotic use; Public Health Ontario has previously identified and described common [ASP strategies in hospital settings](#). While some of these hospital strategies may be adapted in LTC settings, effective ASP strategies must ultimately consider the unique barriers and challenges in LTC.

Before the Prescription

These “front-end strategies” attempt to ensure antibiotics are only used when appropriate; when symptoms are most likely due to a bacterial infection. The goal is to minimize the number of antibiotics, or number of high-risk antibiotics that are prescribed to begin with.

Clinical tools for assessing residents with suspected infection. Many antibiotic starts are influenced by physician-nursing communications.^{6,10,11} Tools to facilitate structured communication between front-line staff and prescribers have been promoted to increase standardization in resident assessments, encourage appropriate action from prescribers and improve patient safety. For example, SBAR (Situation-Background-Assessment-Recommendation) tools combined with antibiotic start criteria or infection surveillance criteria, have been recommended to further support rational antimicrobial prescribing when used prior to contacting prescribers.^{21,22} The RAMP tool (Resident Antimicrobial Management Plan) is also a validated tool shown to improve antibiotic use by providing good practice points and a standardized framework for nurses and prescribers in monitoring antibiotic therapy.²³

Figure 2. Decisions and influences that can be modified in the antibiotic prescribing process in long-term care. Antibiotic prescribing is a complex process where decisions are made before, during and after the prescription.

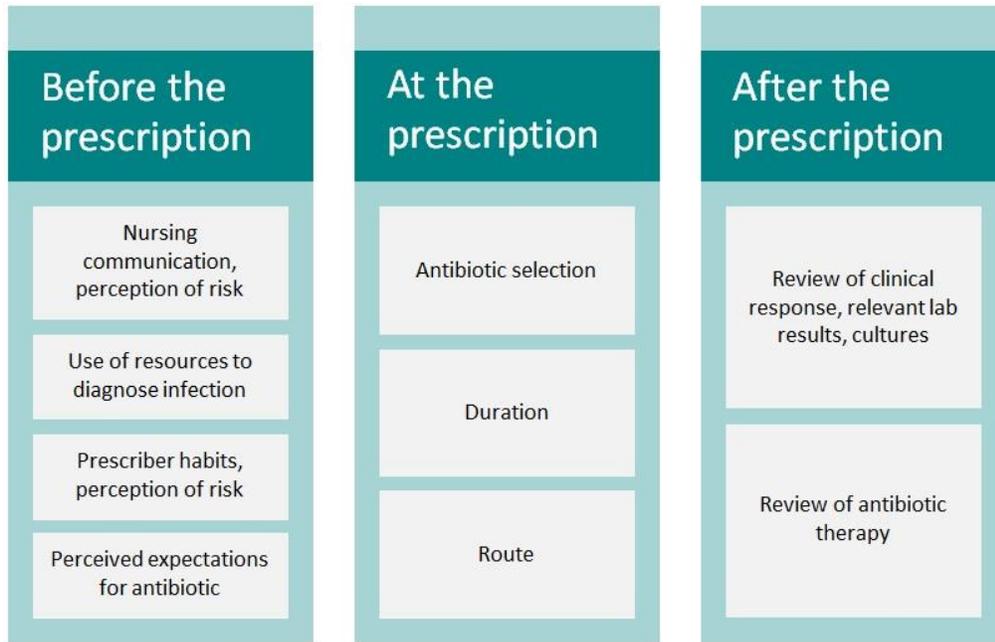
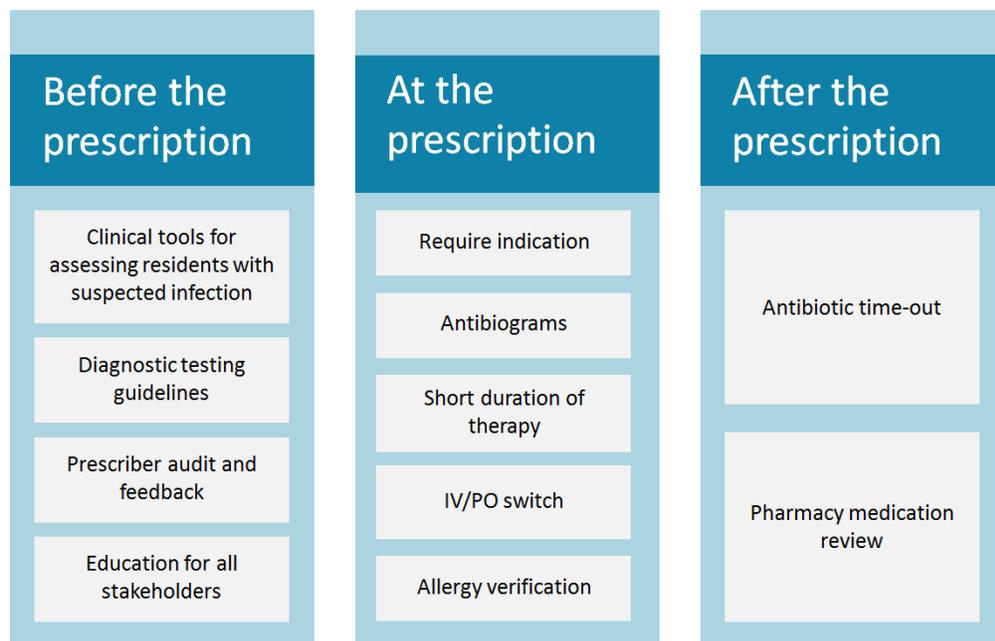


Figure 3. ASP strategies that may impact the antibiotic prescribing process in long-term care. Antimicrobial stewardship involves strategies that target influences and decisions that can be modified through knowledge and behaviour changes.



Diagnostic testing guidelines. Provide guidance on when diagnostic tests such as urine dipsticks, urinalysis, chest radiographs or wound swabs are appropriate. It is not uncommon that antibiotics are started due to a positive lab result or incidental finding, even if it may not be contributing to clinical symptoms. This strategy attempts to reduce antibiotic starts for residents whose symptoms are not likely due to infection, but will produce a positive lab result if tested due to colonization. Resources and education should also consider best practices to ensure a timely and meaningful result (i.e. reduce contamination, or invalid results).^{6,21}

Prescriber audit and feedback. This strategy involves influencing behaviour change in prescribers by comparing prescribing practices relative to peers or accepted guidelines.²⁴ This type of peer comparison has been associated with sustainable and positive improvements in antibiotic use, especially when combined with other interventions. When audit and feedback is used, prescribers are encouraged to review periodic reports on their own antimicrobial prescribing patterns and consider possible change ideas to improve or maintain their prescribing practices.

Education for prescribers, clinical staff, residents and family regarding the role of antibiotics and perceived risks. While knowledge of infectious disease guidelines and pharmacology of antibiotics is important in antibiotic use, education from an ASP perspective also involves encouraging all stakeholders to understand the potential harms of antibiotic overuse and the benefits of reducing antibiotic use. Education should also acknowledge barriers such as resistance to behaviour change and misunderstandings on the goals of antimicrobial stewardship.^{25,26} Education strategies are recommended to be adjunctive or combined with another ASP strategy.⁷ Conveying a consistent message on the benefits and risks of antibiotics is important for all front-line staff, from personal support workers to on-call staff who directly care for and engage residents and families.¹⁸

At the Prescription

Once the decision is made to prescribe an antibiotic for a specific indication, “prescriptive strategies” attempt to optimize the initial empiric therapy in established treatment guidelines, with an additional antimicrobial stewardship lens.

Require indication for antibiotic. Requiring prescribers to document indication for antibiotics allows for quality assurance of appropriate use. This policy can prompt clinicians to use appropriate clinical algorithms and provide information for pharmacy medication reviews.³

Optimize selection with antibiograms. Antibiograms describe susceptibility patterns of isolated organisms to antibiotics and can show changes in antimicrobial resistance patterns over time.²⁷ Some microbiology laboratories provide antibiograms for specific regions. Empiric treatment guidelines for acute infections may be significantly altered depending on local resistance rates of the target organism. In understanding susceptibility rates of common infectious organisms in your region, you can tailor antibiotic selection of empiric therapy in your home.

Optimize duration of therapy. ASPs in LTC are recommended to implement guidelines and strategies to reduce antimicrobial therapy to the shortest effective duration.^{16,18,19} While duration of therapy is

indication-specific and should account for resident-specific factors, studies have shown antibiotics prescribed in LTC are often longer than necessary.²⁸ Clinical decision tools to reduce prolonged days of therapy (i.e., longer than seven days) and excessive drug exposure in elderly residents may minimize harms such as risk of CDI and adverse drug events.

Optimize administration route. Optimizing use of oral antibiotics and timely switch from intravenous-to-oral (IV/PO) therapy can help reduce costs of drug administration and possible complications from intravenous therapy.^{16,29} Some oral antibiotics are as bioavailable and efficacious as the intravenous form and more cost-effective. Clinical algorithms or resources can include guidance on when to start or switch to oral therapy for a specific infection.

Allergy verification. Inaccurate allergy labels may expose patients to less preferred therapies, increased broad spectrum antimicrobial use, risk of toxicity, and additional health care costs.^{11,30,31} ASPs have been encouraged to promote structured allergy assessments and penicillin skin testing when appropriate, to improve use of first-line antibiotics.^{10,16} A proactive and comprehensive approach to allergy labels in LTC may range from accurate history of symptoms to specialist referrals for allergy testing when appropriate.^{10,11,32}

After the Prescription

After the initial antibiotic prescription, “back-end strategies” assess if further therapy is necessary, safe and effective. These strategies attempt to optimize appropriateness of antibiotic use after the clinical picture of the resident is clearer (e.g. symptom stabilization, available lab/culture results, etc.).

Antibiotic “time-out.” The circumstances when starting antibiotics can be highly influenced by subjective pressures. Routine antibiotic time-outs encourage reducing antibiotic exposure, by reviewing a resident’s status, usually two to three days after an antibiotic start, with relevant laboratory results and/or imaging studies.^{6,16,33} This strategy optimizes opportunities to reassess duration of therapy, stop antibiotics if infection is ruled out or switch antibiotics according to clinical response or culture results (de-escalation and streamlining).³⁴

Pharmacy medication reviews. Pharmacist-directed reviews can provide quality assurance on adherence to your ASP strategies including antibiotic indication, dosing, route of administration and duration. Scheduled reviews can be focused initially on high-risk or broad spectrum antibiotics (e.g. fluoroquinolones) or high-risk residents (e.g. recurrent infections) and subsequently expanded to include other classes of antibiotics or groups of residents.²² Pharmacists may also assist with timely review of culture results to further guide antibiotic appropriateness. This intervention is also referred to as “prospective audit and feedback” when it includes a review and discussion of an *active* antibiotic prescription with the prescriber.³⁵

Selecting an ASP Strategy

Different strategies may be implemented to encourage adherence to what you have defined as appropriate antibiotic use. Strategies selected for implementation will depend on resources available in your home. In practice, you may find one policy or decision tool can address several ASP strategies.

Start with one or two changes. Small changes and pilot studies are encouraged, especially if you are starting your ASP with limited resources. You may be able to implement more changes as your ASP matures.

Target a specific barrier. Prioritize efforts on an ASP strategy that addresses a specific barrier to appropriate antibiotic use in your home. Develop plans to address potential barriers and challenges including resistance to change, high staff turnover or lack of data management.

Leverage an advantage. Consider where practice change would be the easiest in your home, or in an area where you have the most resources. Make note of advantages such as physician champions, dedicated nursing staff, strong pharmacy support or innovative technology.

Consider some immediate actions that can be taken to effect improvement and motivate change. Recall some of the common reasons for antibiotic misuse in long-term care.

For change ideas and resources to support your decision, see PHO's [Antimicrobial Stewardship Essentials Checklist in Long-Term Care](#).

Step 4: Establishing Measures

How Will We Know that a Change is an Improvement?

Collecting data for program measures may be the most challenging and labour-intensive step for an ASP in LTC; however, it is important to monitor program performance and attempts to rationalize antibiotic use. Similar to surveillance in infection prevention and control, sources of information may include chart reviews, laboratory reports, nursing Kardex/patient profiles, clinical ward rounds, sentinel reporting system or electronic screening of patient records.

Process Measures

Process measures determine if new changes are being followed. They can give insight into how and why antibiotics are prescribed and the acceptance or level of staff engagement with ASP initiatives.³⁶ Development of process surveillance forms, tracking tools, or audit criteria may help with data collection and spreadsheet analysis.

Key ASP Component:

Monitoring and Evaluation

“The literature consistently identifies the critical role of benchmarks, audit and evaluation systems to establish the appropriate use of antimicrobials.”¹

Adherence to antibiotic start criteria. This provides insight into how antibiotics are being used. Monitoring the rate of antibiotics started according to minimum start criteria estimates “appropriateness” of antibiotic use (e.g., number of antibiotic starts meeting start criteria / total number of antibiotic starts).^{36,37}

Adherence to ASP strategies. A measure for process surveillance depends on the strategy selected for implementation. For example, with a new policy on when

to do urine cultures, an ASP may want to measure the number of tests done before and after the policy and whether criteria for testing the urine was met. Or if antibiotic time-outs are implemented, measure how many antibiotic starts were reassessed after 48 to 72 hours. Persistently low adherence rates should be investigated for barriers to adherence or changes to protocols. Once a strategy is well-established, process measures may be modified, reduced in frequency or even removed.

Outcome Measures

In a QI framework, outcome measures track the impact of changes on the target population. In terms of antimicrobial stewardship, outcome measures should provide insight into whether ASP strategies have impacted antimicrobial resistance, antibiotic use and related clinical effects in the resident population.³⁶

Reduced antibiotic use is typically equated with more “appropriate” antibiotic use; however, while one expects to see a reduction in antibiotic use initially with any successful ASP effort, this may plateau or stabilize with program maturity. Stewardship efforts then typically shift from reduction of antibiotic use

to maintaining appropriate use. Research to identify effective and practical ASP outcomes in LTC continues to grow, but there is still little evidence to support any specific metric at this time.³⁸

Antibiotic starts. Determine the rate of new antibiotic starts or antibiotic starts for specific infections in a selected time period.^{36,38} The reported rate is adjusted according to bed utilization, per 1000 resident-days. Pharmacy reports on antibiotic use can be useful to estimate antibiotic starts overall. Infection surveillance activities can be helpful to estimate antibiotic starts for specific infections (e.g. number of antibiotic starts for UTI / resident-days per month x 1000). Reductions in antibiotic starts may be a marker of improved antibiotic use, or positive uptake of educational initiatives on appropriate antibiotic use.

Days of therapy (DOT). This measure describes the number of days a resident is on an antibiotic. DOT is one of the most commonly used and recommended metric in ASP efforts.^{16,36-38} This measure is obtained by adding up every day that a resident received a unique antibiotic; treatment with multiple antibiotics at the same time has an additive effect on the measure (e.g. ceftriaxone and azithromycin for 5 days = 10 DOT). The sum of DOTs for each time period is then adjusted per 1000 resident-days. Manual data collection can be labour-intensive and challenging, thus consulting your electronic records vendor or pharmacist is recommended for this metric.³⁶ DOT should not be confused with duration of therapy metrics; DOT helps to reflect the total antibiotic exposure in the resident population, whereas duration of therapy metrics reflect information about individual prescriptions and providers' prescribing patterns.

Antibiotic costs. In acute care, ASPs have been shown to reduce hospital pharmacy costs.³⁶ Specifically, it may be worthwhile to monitor prescribing of high-cost antibiotics. These cost savings can be useful to help support ASP activities, but should not be used solely to justify the value of ASPs.³⁸ Additionally, this measure can be misleading when drug costs are dependent on supplies of brand or generic forms or pricing negotiations.

C. difficile infection (CDI). Reducing CDI rates is recommended as a high priority for ASPs designing strategies to improve antibiotic use.¹⁶

Balancing Measures

Balancing measures look at whether new problems are created as a result of changes made.⁸ Efforts to track balancing measures, such as sentinel events, can reassure LTCHs that their changes in antibiotic use are safe and improving outcomes for their residents. Unintended consequences can be interesting to consider, but may require some additional insight or resourcefulness to measure in most LTCHs. These may range from shifts in laboratory or diagnostic testing, use of non-antibiotic or alternative therapies for symptoms, to changes in on-call services.

Health care utilization. Tracking emergency department visits and hospital admissions can be measured to ensure there are no changes in health care utilization after implementation of a new ASP strategy. Results should be interpreted with caution, as changes in health care utilization can be multifactorial.

Mortality. Mortality is an important balancing measure to consider, but it is also difficult to associate with an intervention given its relatively low rate and multi-factorial nature.³⁷ In acute care, it has been shown that ASPs can safely and effectively reduce unnecessary antibiotic use, without increasing the risk of mortality.³⁹ Research for ASP in LTC continues to grow; however, there is also sufficient evidence to suggest that ASPs in LTC do not increase hospitalization or mortality.⁵

Step 5: Testing and Sustaining Changes

Testing Changes

It is recommended to pilot ASP interventions on a small scale (e.g., a single unit). Knowledge from this pilot can then be expanded on a broader scale (e.g., organization-wide). Implementation will naturally be different in each home, depending on expertise and available resources.

Plan-Do-Study-Act (PDSA) cycles can be helpful to test a change idea or ASP strategy you are considering or looking to improve in your home. The steps to implement ASP strategies in LTC are beyond the scope of this document; however, there are a growing number of robust and successful implementation resources.

Sustainability

Ongoing quality improvement and feedback is important to successful programs. ASPs also need active maintenance to sustain changes in antibiotic use and evolve with ongoing research. Many programs are initially successful with motivated champions, but with staff turnover and loss of support, staff may go back to their previous ways. Practices and behaviours may also evolve with time and familiarity or due to workarounds or shortcuts, so that the intended outcome is no longer achieved. Policies and guidelines require ongoing review with changes in best practices, updated treatment guidelines and new research.

Key ASP Component:

Future research

“[Leverage] expertise from across research disciplines...in order to address information gaps, and ensure evidence is available and applied for greatest impact.”¹

Regular feedback. There should be a mechanism to feedback results of your ASP measures to stakeholders and clinicians. Processes for obtaining program measures and dissemination of ASP results must be routine and sustainable. This allows leadership to monitor performance, reinforces behaviour changes and encourages staff to see impact of practices changes. Feedback also promotes reflection on further strategies to improve antibiotic use, ongoing barriers to change, adaption of best practices and adjustments to meet the needs of your residents and home.

Integrate changes. Ensure your new changes or ASP strategies are integrated into the work culture of your home. ASP strategies, policies and procedures can be included in employee manuals, orientation packages or as a standing item in staff meetings. It will be important to train new staff of ASP policies and remind current staff of behaviour changes. Consider including on-call staff and external local stakeholders in training. New and existing residents and families can also be included in this culture in welcome packages and reminders to sustain ASP awareness.

References

1. Pan-Canadian Public Health Network. Antimicrobial Stewardship. The Communicable and Infectious Disease Steering Committee Task Group on Antimicrobial Use Stewardship: final report to the Public Health Network Council [Internet]. Ottawa, ON: Pan-Canadian Public Health Network; 2016 [cited 2018 Aug 8]. Available from: <http://www.phn-rsp.ca/pubs/anstew-gestan/index-eng.php>
2. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antibiotic overuse in Ontario's long-term care homes [Internet]. Toronto, ON: Queen's Printer for Ontario; 2016 [cited 2023 Jun 5]. Available from: https://www.publichealthontario.ca/-/media/Documents/A/2017/antibiotic-overuse-ltc.pdf?rev=380934fcfc8b4cca97ce6b6e3e8d7ae0&sc_lang=en
3. Centers for Disease Control and Prevention. The core elements of antibiotic stewardship for nursing homes [Internet]. Atlanta, GA: US Department of Health and Human Services; 2016 [cited 2023 Jun 21]. Available from: <https://www.cdc.gov/antibiotic-use/core-elements/pdfs/core-elements-antibiotic-stewardship-H.pdf>
4. Rhee SM, Stone ND. Antimicrobial stewardship in long-term care facilities. *Infect Dis Clin North Am*. 2014;28(2):237-46.
5. Feldstein D, Sloane PD, Feltner C. Antibiotic stewardship programs in nursing homes: a systematic review. *J Am Med Dir Assoc*. 2018;19(2):110-6.
6. Crnich CJ, Jump R, Trautner B, Sloane PD, Mody L. Optimizing antibiotic stewardship in nursing homes: a narrative review and recommendations for improvement. *Drugs Aging*. 2015;32(9):699-716. Available from: <https://rd.springer.com/article/10.1007%2Fs40266-015-0292-7>
7. Fishman N. Policy statement on antimicrobial stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS). *Infect Control Hosp Epidemiol*. 2012;33(4):322-7.
8. Health Quality Ontario. Quality improvement guide [Internet]. Toronto, ON: Queen's Printer for Ontario; 2012 [cited 2018 Aug 8]. Available from: <http://www.hqontario.ca/portals/0/Documents/qi/qi-quality-improve-guide-2012-en.pdf>
9. Jump RLP, Gaur S, Katz MJ, Crnich CJ, Dumyati G, Ashraf MS, et al. Template for an antibiotic stewardship policy for post-acute and long-term care settings. *J Am Med Dir Assoc*. 2017;18(11):913-20. Available from: [https://www.jamda.com/article/S1525-8610\(17\)30430-9/pdf](https://www.jamda.com/article/S1525-8610(17)30430-9/pdf)

10. Olans RN, Olans RD, DeMaria A Jr. The critical role of the staff nurse in antimicrobial stewardship—unrecognized, but already there. *Clin Infect Dis*. 2016;62(1):84-9. Available from: <https://academic.oup.com/cid/article/62/1/84/2462624>
11. Sumner S, Forsyth S, Collette-Merrill K, Taylor C, Vento T, Veillette J, et al. Antibiotic stewardship: the role of clinical nurses and nurse educators. *Nurse Educ Today*. 2018;60:157-60. Available from: [https://www.nurseeducationtoday.com/article/S0260-6917\(17\)30251-4/pdf](https://www.nurseeducationtoday.com/article/S0260-6917(17)30251-4/pdf)
12. Stone ND, Ashraf MS, Calder J, Crnich CJ, Crossley K, Drinka P, et al. Surveillance definitions of infections in long-term care facilities: revisiting the McGeer Criteria. *Infect Control Hosp Epidemiol*. 2012;33(10):965-77. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3538836/>
13. Jump RL, Olds DM, Seifi N, Kyriotakis G, Jury LA, Peron EP, et al. Effective antimicrobial stewardship in a long-term care facility through an infectious disease consultation service: keeping a LID on antibiotic use. *Infect Control Hosp Epidemiol*. 2012;33(12):1185-92. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4370223/>
14. Loeb M, Bentley DW, Bradley S, Crossley K, Garibaldi R, Gantz N, et al. Development of minimum criteria for the initiation of antibiotics in residents of long-term-care facilities: results of a consensus conference. *Infect Control Hosp Epidemiol*. 2001;22(2):120-4.
15. Loeb M, Brazil K, Lohfeld L, McGeer A, Simor A, Stevenson K, et al. Effect of a multifaceted intervention on number of antimicrobial prescriptions for suspected urinary tract infections in residents of nursing homes: cluster randomised controlled trial. *BMJ*. 2005;331(7518):669. Available from: <https://www.bmj.com/content/bmj/331/7518/669.full.pdf>
16. Barlam TF, Cosgrove SE, Abbo LM, MacDougall C, Schuetz AN, Septimus EJ, et al. Implementing an antibiotic stewardship program: guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clin Infect Dis*. 2016;62(10):e51-77. Available from: <https://academic.oup.com/cid/article/62/10/e51/2462846>
17. Khandelwal C, Lathren C, Sloane P. Ten clinical situations in long-term care for which antibiotics are often prescribed but rarely necessary. *Ann Longterm Care*. 2012;20(4):23-9.
18. Dyar OJ, Pagani L, Pulcini C. Strategies and challenges of antimicrobial stewardship in long-term care facilities. *Clin Microbiol Infect*. 2015;21(1):10-9. Available from: [https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X\(14\)00036-6/pdf](https://www.clinicalmicrobiologyandinfection.com/article/S1198-743X(14)00036-6/pdf)
19. Daneman N, Campitelli MA, Giannakeas V, Morris AM, Bell CM, Maxwell CJ, et al. Influences on the start, selection and duration of treatment with antibiotics in long-term care facilities. *CMAJ*. 2017;189(25):E851-60. Available from: <http://www.cmaj.ca/content/cmaj/189/25/E851.full.pdf>
20. van Buul LW, van der Steen JT, Doncker SM, Achterberg WP, Schellevis FG, Veenhuizen RB, et al. Factors influencing antibiotic prescribing in long-term care facilities: a qualitative in-depth study.

BMC Geriatr. 2014;14:136. Available from:

<https://bmcgeriatr.biomedcentral.com/track/pdf/10.1186/1471-2318-14-136>

21. Centers for Disease Control and Prevention. The core elements of antibiotic stewardship for nursing homes: appendix A: policy and practice actions to improve antibiotic use [Internet]. Atlanta, GA: US Department of Health and Human Services, CDC; 2016 [cited 2023 Jun 21]. Available from: <https://www.cdc.gov/antibiotic-use/core-elements/pdfs/core-elements-antibiotic-stewardship-appendix-a-508.pdf>
22. Brandt NJ, Heil E. Antimicrobial stewardship in the post-acute long-term care setting: case discussion and updates. *J Gerontol Nurs*. 2016;42(7):10-4.
23. Fleet E, Gopal Rao G, Patel B, Cookson B, Charlett A, Bowman C, et al. Impact of implementation of a novel antimicrobial stewardship tool on antibiotic use in nursing homes: a prospective cluster randomized control pilot study. *J Antimicrob Chemother*. 2014;69(8):2265-73. Available from: <https://academic.oup.com/jac/article/69/8/2265/2911263>
24. Ivers N, Jamtvedt G, Flottorp S, Young JM, Odgaard-Jensen J, French SD, et al. Audit and feedback: effects on professional practice and healthcare outcomes. *Cochrane Database Syst Rev*. 2012;13(16):CD000259.
25. Zimmerman S, Sloane PD, Bertrand R, Olsho LEW, Beeber A, Kistler C, et al. Successfully reducing antibiotic prescribing in nursing homes. *J Am Geriatr Soc*. 2014;62(5):907–12.
26. Monette J, Miller M, Monette M, Laurier C, Boivin JF, Sourial N, et al. Effect of an educational intervention on optimizing antibiotic prescribing in long-term care facilities. *J Am Geriatr Soc*. 2007;55(8):1231–5.
27. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antimicrobial Stewardship Strategy: antibiograms [Internet]. Toronto, ON: Queen’s Printer for Ontario; 2016 [cited 2018 Aug 9]. Available from: https://www.publichealthontario.ca/apps/asp-strategies/data/pdf/ASP_Strategy_Antibiograms.pdf
28. Daneman N, Gruneir A, Bronskill SE, Newman A, Fischer HD, Rochon PA, et al. Prolonged antibiotic treatment in long-term care: role of the prescriber. *JAMA Intern Med*. 2013;173(8):673-82. Available from: <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/1669102>
29. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antimicrobial Stewardship Strategy: intravenous to oral conversion [Internet]. Toronto, ON: Queen’s Printer for Ontario; 2016 [cited 2023 Jun 5]. Available from: https://www.publichealthontario.ca/apps/asp-strategies/data/pdf/ASP_Strategy_Intravenous_Oral_Conversion.pdf
30. Trubiano J, Phillips E. Antimicrobial stewardship’s new weapon? A review of antibiotic allergy and pathways to ‘de-labeling’. *Curr Opin Infect Dis*. 2013;26(6):526-37. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3862073/>

31. Trubiano JA, Chen C, Cheng AC, Grayson ML, Slavin MA, Thursky KA, et al. Antimicrobial allergy 'labels' drive inappropriate antimicrobial prescribing: lessons for stewardship. *J Antimicrob Chemother.* 2016;71(6):1715-22. Available from: <https://academic.oup.com/jac/article/71/6/1715/1750617>
32. Hall T, Gauthier T, Temino V, Lichtenberger P. An Antimicrobial Stewardship Initiative to Evaluate Penicillin Allergy Labels in Spinal Cord Injury and Long-Term Care Patients. *Open Forum Infect Dis.* 2017;4 Suppl 1:S261. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5632208/>
33. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antimicrobial Stewardship Strategy: scheduled antimicrobial reassessments ("antibiotic time outs") [Internet]. Toronto, ON: Queen's Printer for Ontario; 2016 [cited 2023 Jun 5]. Available from: https://www.publichealthontario.ca/apps/asp-strategies/data/pdf/ASP_Strategy_Scheduled_Antimicrobial_Reassessments.pdf
34. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antimicrobial Stewardship Strategy: de-escalation and streamlining [Internet]. Toronto, ON: Queen's Printer for Ontario; 2016 [cited 2023 Jun 5]. Available from: https://www.publichealthontario.ca/apps/asp-strategies/data/pdf/ASP_Strategy_De-escalation_Streamlining.pdf
35. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Antimicrobial Stewardship Strategy: prospective audit with intervention and feedback [Internet]. Toronto, ON: Queen's Printer for Ontario; 2016 [cited 2018 Aug 9]. Available from: https://www.publichealthontario.ca/apps/asp-strategies/data/pdf/ASP_Strategy_Prospective_Audit_Intervention_Feedback.pdf
36. Centers for Disease Control and Prevention. The core elements of antibiotic stewardship for nursing homes: appendix B: measures of antibiotic prescribing, use and outcomes [Internet]. Atlanta, GA: US Department of Health and Human Services, CDC; 2016 [cited 2018 Aug 9]. Available from: <https://www.cdc.gov/antibiotic-use/core-elements/pdfs/core-elements-antibiotic-stewardship-appendix-b-508.pdf>
37. Morris AM. Antimicrobial stewardship programs: appropriate measures and metrics to study their impact. *Curr Treat Options Infect Dis.* 2014;6(2):101-12. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4431704/>
38. Mylotte JM. Antimicrobial stewardship in long-term care: metrics and risk adjustment. *J Am Med Dir Assoc.* 2016;17(7):672.e13-8
39. Davey P, Marwick CA, Scott CL, Charani E, McNeil K, Brown E, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. *Cochrane Database Syst Rev.* 2017;2: CD003543. Available from: <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD003543.pub4/media/CDSR/C003543/CD003543.pdf>

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