

## Should Traditional Antimicrobial Stewardship (AMS) Models Incorporating Clinical Pharmacists with Full-Time AMS Responsibilities Be Replaced by Models in Which Pharmacists Simply Participate in AMS Activities as Part of Their Routine Ward or Team-Based Pharmaceutical Care?

### THE “PRO” SIDE

Antimicrobial stewardship (AMS) “refers to a set of coordinated strategies to improve the use of antimicrobial medications with the goal of enhancing patient health outcomes, reducing resistance to antibiotics, and decreasing unnecessary costs”.<sup>1</sup> Accreditation Canada requires every acute care institution to have a formal antimicrobial stewardship program (ASP).<sup>2</sup> Guidelines recommend how such programs should be developed and implemented, including the role of hospital pharmacists.<sup>3</sup> The provision by pharmacists of prospective audit and feedback, educational meetings and outreach, printed educational materials, and reminders about AMS-specific initiatives has been shown to improve antimicrobial utilization and prescribing appropriateness, and may also reduce super-infections, antibiotic resistance, and antimicrobial costs.<sup>4</sup> However, evidence suggests that the most successful and sustainable persuasive interventions for improvement are led by clinical teams, rather than by a professional from outside the provider team, as is common in traditional ASP models.<sup>5</sup>

The deployment of service- or ward-based pharmacists across an institution to provide direct patient care as part of interprofessional teams results in safe, effective, and cost-conscious drug therapy that improves patient outcomes.<sup>6-8</sup> Pharmacists accomplish these goals by working with their respective teams and with patients to perform admission and discharge medication reconciliation, resolve drug therapy problems, implement pharmaceutical care plans, participate in patient care rounds, provide inpatient education about diseases and medications, and provide discharge medication education and counselling.<sup>9</sup> Moreover, pharmacists are more effective in improving the quality of drug therapy for patients when they are providing proactive, team-based care, as opposed to reactive, consultation-based care.<sup>6,7</sup> However, pharmacists continue to be relatively scarce at Canadian hospitals, with a total of about 2900 full-time pharmacists employed in hospitals across Canada.<sup>10</sup> Ideally, the ratio of clinical pharmacists to beds (excluding critical care beds) should be about 1:30,<sup>8</sup> yet it is probable that many hospitals across Canada have

yet to achieve this benchmark, one that is associated with improved patient survival and reduced cost of care.

The key question for hospital pharmacy decision-makers is not whether we should include pharmacists as an essential component of an institutional ASP, but rather, how we should integrate pharmacists into ASPs to realize the best value for patients and the health care system. Specifically, does engaging service- or ward-based pharmacists to provide formal AMS activities within a patient-centred pharmaceutical care model produce greater value than deploying pharmacists to perform AMS-only activities according to drug- or disease-specific triggers? One small retrospective study aimed to determine the relative impact on ASP quality of a pharmacist dedicated to AMS and geographically based ward pharmacists performing AMS activities.<sup>11</sup> An ASP with a dedicated infectious diseases pharmacist was associated with greater adherence to recommended antimicrobial therapy practices, such as timely de-escalation of therapy, than an ASP that relied on ward pharmacists. However, the quality of the study was low because of lack of control for potential confounders and absence of an evaluation of important processes and outcomes unrelated to AMS, for which improvements would have been expected in the ward pharmacist arm of the study. More importantly, no concurrent interventions were delivered to improve ward pharmacists’ AMS knowledge and behaviour.

Two studies have evaluated the impact of interventions on the effectiveness of ward pharmacist contributions to AMS-related initiatives. In one of these studies, providing education to generalist pharmacists improved the quality of antimicrobial management; however, no specific evaluation of pharmacist knowledge transfer was performed.<sup>12</sup> In the other study, we evaluated the effect of behavioural change strategies on knowledge translation and pharmacists’ interventions for AMS.<sup>13</sup> We found that a simple, multifaceted intervention targeting ward pharmacists resulted in significant increases in pharmacists’ therapeutic knowledge of urinary tract infection and pneumonia and pharmacist-led interventions that improved antimicrobial utilization.<sup>13</sup>

An institutional ASP should ideally employ both a pharmacist and a physician in leadership positions. But how should valuable front-line pharmacist resources be deployed within such an ASP? The selection of a particular model should not be based only on AMS-related end points. Rather, a system-wide decision-making approach should be undertaken that incorporates principles of evidence-based medicine, overall health care quality, and alignment with professional, provincial, and local health care system goals.

**Table 1. Considerations for Determining Relative Value of Pharmacist Deployment Models for AMS**

Decision-Making Criteria	Traditional AMS Pharmacist*	Ward-Based Pharmacist†
<b>Quality of evidence</b>		
Study design (best)	RCT	RCT
Study quality	Low to moderate	Moderate to high
Consistency	Inconsistent	Consistent
Directness	Direct	Direct
<b>Domains of health care quality</b>		
Safe drug use	Yes	Yes
Effective drug use	Yes	Yes
Patient-centred care	No	Yes
Timely care	?	Yes
Efficient care	?	Yes
Equitable care	No	Yes
<b>Hierarchy of outcomes improved</b>		
Patient outcomes	Yes	Yes
Processes of care	Yes	Yes
Humanistic outcomes‡	No	Yes
Financial outcomes	?	Yes
<b>Other considerations</b>		
Proactive patient triage	No	Yes
Proactive care	?	Yes
Interprofessional care	?	Yes
Aligned with ward/service	No	Yes
Aligned with cpKPI	No	Yes
Supports capacity building	No	Yes
Supports ward initiatives	No	Yes
Supports RPh engagement	?	Yes
DPC residency rotations	?	Yes
Fosters relationships (teams)	?	Yes
Supports innovation	?	Yes

AMS = antimicrobial stewardship, cpKPI = clinical pharmacy key performance indicators, DPC = direct patient care, RCT = randomized controlled trial, RPh = registered pharmacist, ? = unknown or inconsistent effect.

\*A traditional AMS pharmacist primarily provides persuasive interventions targeting specific antimicrobials and diseases, with or without an actively rounding interprofessional team.

†A ward- or service-based pharmacist provides team-based care that includes formal AMS activities as part of care delivery.

‡Humanistic outcomes include patient's knowledge, adherence, satisfaction, and quality of life.

We feel that the ward-based pharmacist model offers several advantages (Table 1). There is higher-quality, direct, and consistent evidence showing that the ward-based pharmacist model improves processes of care and clinical, humanistic, and financial outcomes. This model improves quality across more domains that are important in health care, such as safety, effectiveness, and efficiency. Furthermore, clinical pharmacy practice has advanced over the past several decades to promote proactive, interprofessional, evidence-based, patient-centred care to improve health outcomes. ASPs should be innovative and should capitalize on access to the established interprofessional network to which pharmacists belong, rather than focusing on drug-centric, pharmacist-driven, reactive approaches to meet AMS objectives.

Which model adds the most value to the patient and the system while also achieving global ASP aims? We think the answer is clear.

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**Competing interests:** None declared.

## THE "CON" SIDE

Clinical pharmacists play an essential role in the practice of antimicrobial stewardship (AMS) in hospital and outpatient settings. However, to be successful, formal AMS programs require pharmacists with training, expertise, and dedicated time. Beyond possessing specialized knowledge related to infectious diseases, the AMS pharmacist fulfills a role that involves design and implementation of AMS interventions, measurement of program outcomes, communication of data and results to institutional stakeholders, and application of change management strategies. Thus, the pharmacist with dedicated AMS responsibilities contributes to the program at both the institutional and the individual patient level.

Currently, clinical ward-based pharmacists are expected to participate in AMS activities as part of routine pharmaceutical care. According to the Canadian Society of Hospital Pharmacists position statement on AMS, every pharmacist should incorporate stewardship principles (timely initiation and discontinuation, appropriate selection, and optimal dosing, route, and duration of antimicrobial therapy) as part of routine practice.<sup>1</sup> Similarly, the American Society of Health-System Pharmacists (ASHP) statement on the pharmacist's role in AMS and infection prevention and control notes that pharmacists have a responsibility to take prominent roles in AMS programs.<sup>2</sup> The ASHP statement indicates that pharmacists should promote optimal use of antimicrobial agents as a key clinical activity, through functions such as multidisciplinary collaboration, participation in pharmacy and therapeutics committees, and facilitation of safe medication practices for antimicrobials. The expectation of these health-system pharmacist organizations is that all clinical pharmacists

will incorporate stewardship-related activities into their daily practice. The ASHP statement also refers to pharmacist roles that are more focused with respect to AMS, such as working with microbiology laboratory and information technology departments to ensure the accuracy and relevance of reports. However, these roles are not within the scope of clinical pharmacists' routine pharmaceutical care at the unit level. Other organizations, such as the US Centers for Disease Control and Prevention (CDC), have also published documents outlining the structure and core elements of a successful AMS program, which refer to the essential role of pharmacy leadership and drug expertise.<sup>3</sup> The CDC document<sup>3</sup> differs from the ASHP statement<sup>2</sup> in that it explicitly speaks to development and implementation of a whole program within an institution and identifies specific interventions that would be appropriate to integrate into clinical pharmacists' activities. All of these activities described as appropriate for a clinical pharmacist align with the clinical pharmacy Key Performance Indicators (cpKPIs) proposed for pharmacists in Canada, specifically, participation in interprofessional patient care rounds, completion of pharmaceutical care plans, and resolution of drug therapy problems.<sup>4</sup>

Effective AMS by pharmacists requires core competencies and confidence in their knowledge of antimicrobial therapy and the appropriate management of infectious syndromes. Many clinical pharmacists identify a lack of confidence in their knowledge of infectious diseases as an area of weakness in their clinical practice. In many programs that have successfully integrated AMS interventions into routine clinical practice, pharmacists have been given additional education, either through an external program or provided by the AMS pharmacist or infectious diseases physician.<sup>5,6</sup> Often, the AMS pharmacist not only delivers the education but designs and evaluates the curriculum as well.<sup>5</sup>

Carreno and others<sup>5</sup> demonstrated that clinical pharmacists are effective at incorporating stewardship activities into routine practice as part of an overall AMS program in which the implementation, evaluation, and oversight of interventions were the responsibility of the AMS pharmacist. This finding highlights the ability to effectively expand the breadth of an AMS program through utilization of the clinical pharmacist role on the bedside interprofessional team. Additionally, in institutions that have described implementation of an AMS program without including either a pharmacist with infectious diseases training or an infectious diseases physician, program success was dependent on the allocation of dedicated time for pharmacists to perform AMS activities.<sup>6</sup>

More importantly, even when clinical pharmacists with infectious diseases training incorporate AMS activities into their regular patient care activities, they do not achieve the same outcomes with respect to changing antimicrobial use as pharmacists with time dedicated to AMS activities.<sup>7</sup> This result may be explained by other factors beyond the pharmacist having

specialized infectious diseases knowledge and may be related to the prescriber's acceptance of this knowledge or the communication methods used by the AMS pharmacist. When AMS interventions are incorporated into routine pharmaceutical care, they become one of many activities and may not garner sufficient attention or be valued in the same way as when they are separated out as the single focus of interaction between the prescriber and the AMS pharmacist. Another difference between interactions involving an AMS pharmacist and a prescriber and those involving the clinical team pharmacist is the objectivity of the AMS pharmacist. The latter does not have the same investment in the ward team's dynamics and is essentially an "outsider" from both the team and the patient's immediate circle of care. This perspective gives the AMS pharmacist the ability to present objective information related to the patient's clinical status and antimicrobial needs. Antimicrobial prescribing is often described as an emotional process, more so than prescribing for most other conditions.<sup>8,9</sup> Antimicrobial prescribing is also associated with a certain level of uncertainty and fear of being wrong and missing an infection that could lead to serious morbidity or mortality. The AMS clinician, whether a pharmacist or another health care professional, has a role in diminishing the prescriber's uncertainty by facilitating the prescriber's articulation of his or her rationale for prescribing a particular antimicrobial. A pharmacist (or physician or nurse) who is outside the immediate circle of care and who has recognized credibility in the subject matter and effective communication skills is thus the ideal AMS clinician.

In summary, we fully support the incorporation of AMS activities into pharmacists' routine pharmaceutical care, and believe that this can be considered a core competency expectation as measured by the proposed cpKPIs. However, it is clear that any coordinated AMS program requires a pharmacist with specific AMS responsibilities to ensure delivery of a comprehensive institutional stewardship program.

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**Competing interests:** Linda Dresser has received unrestricted grants for continuing education programs from Sunovion, Merck, Astellas, and Cubist (Optimer), as well as speaker's honoraria from Sunovion, for work unrelated to the topic of this article. No other competing interests were declared.