EVIDENCE SYNTHESIS SUMMARY:

Interventions to address antimicrobial use

For the Chief Public Health Officer of Canada's 2019 Spotlight Report
Handle with Care: Preserving Antibiotics Now and into the Future

Canada

Contents

Introduction

This evidence synthesis identifies interventions that aim to reduce unnecessary use of antimicrobials (AMU) and antimicrobial resistance (AMR) in the community and primary-care settings in Canada and Organisation for Economic Co-operation and Development (OECD) countries.

Methodology

An evidence review was conducted by the Office of the Chief Public Health Officer (OCPHO) in the Public Health Agency of Canada to identify interventions that target unnecessary use of antimicrobials in community and primary-care practice in Canada and OECD countries. The evidence was categorized by intervention setting for this technical report.

A literature search strategy was developed in conjunction with the Public Health Agency of Canada Health Library based on predefined PICO criteria (Appendix A). Keyword queries were used to identify studies in the following electronic databases: Ovid MEDLINE/PubMed, Embase, PsychINFO, Cochrane, and Campbell collaboration databases. Only studies published after January 1, 2009 (past 10 years) were included for initial screening.

The search focused on community and primary-care interventions to reduce antimicrobial use among the general public, patients, practitioners and prescribers, and the health care system. Interventions in hospital and long-term care settings were excluded. Assessments using any type of comparator, including no intervention, were eligible for inclusion. The primary outcome of interest was unnecessary use of antibiotics; secondary outcomes of interest included patient outcomes, development of antibiotic resistance, patient and provider knowledge, attitudes and beliefs, participation in shared decision making, patient satisfaction with care, quality of patient health care, and changes to regulatory practices or the practice environment.

A title, abstract, and keywords review was conducted by the OCPHO to identify relevant articles from Canada and OECD countries. In all, 439 articles (124 Canadian and 315 OECD articles) were screened, and additional articles/reports were identified by grey-literature and hand searching. Following an initial review, five systematic reviews and 39 primary studies of community-based interventions were retained for further review. Data from systematic reviews and moderate to high-quality primary studies were included in the synthesis.

An independent rapid evidence review and synthesis was commissioned from the Michael G. DeGroote Cochrane Canada and GRADE Centres (McMaster University), which identified interventions, policies, and programs that promote appropriate prescribing. The external review included evidence from systematic reviews retrieved from Ovid MEDLINE, and McMaster University's evidence databases including ACCESSSS, Health Evidence, and Health Systems Evidence; grey literature from the websites of international and national health organizations; and primary research studies from Canada. The findings were cross-referenced with the OCPHO evidence review and 9 articles/reports were included in the synthesis, where appropriate. In all, 37 articles were included in the evidence synthesis summary presented in Table 1.

Limitations

The literature searches conducted were not exhaustive and would not have captured literature not indexed in the indicated databases. Only literature published in English and French was reviewed and some literature may have been excluded on this basis. Risk of bias and study quality was not assessed in this review. Finally, the data set presented includes only recent studies published after January 1, 2009.

Results

Results were grouped into categories of identified AMU community interventions and summarized in Table 1.

TABLE 1: RESEARCH SUMMARY ON COMMUNITY INTERVENTIONS FOR AMU

Intervention Setting	Description	References
Community-based interventions		
Public Awareness Campaign	In a controlled not-randomized trial of a multifaceted public awareness campaign in Italy, antimicrobial prescribing was reduced by ~4%.	Formoso et al., 2013
	A randomized control trial (RCT) in England found that patient-focused posters and leaflets alone are ineffective at decreasing antimicrobial use in the UK. A systematic review of leaflets, sometimes combined with another co-intervention (i.e. delaying antibiotic prescription), found that these interventions were effective.	Hallsworth et al., 2016; de Bont et al., 2015
	Descriptive analyses have linked other large-scale public awareness campaigns to lower prescribing rates, although these have not been rigorously evaluated.	McKay et al., 2011; Plachouras et al., 2014; Fuertes et al., 2010
Interactive community education	Interactive community education programs, including school-based programs, have been shown to increase awareness about antibiotic resistance among participants.	Fonseca et al., 2012; McKay et al. 2011; Price et al., 2011
	Most interactive community education programs have not been assessed with respect to antimicrobial use, although some have been linked to decreases in antimicrobial utilization in ecological studies.	McKay et al., 2011
National Antimicrobial Stewardship Strategy (AMS)	The national AMS strategy in England, which included a suite of actions taken by the Chief Medical Officer to optimize prescribing practice and improve access to and use of surveillance data, has been shown to be successful in reducing antimicrobial use by 14.4% between 2012 and 2017.	Walker et al., 2019

Intervention Setting	Description	References
Community-based interventions		
Community Stewardship	A systematic review found that community antimicrobial stewardship programs involving pharmacists are associated with a reduction in the antibiotic prescribing rate for general practitioners (GPs) (OR= 0.86, 95% CI 0.78 – 0.95).	Saha et al., 2019
	The multifaceted "Do Bugs Need Drugs?" community antimicrobial stewardship program in British Columbia reported an overall decrease of provincial antibiotic prescribing rates by 13.3% since 2005 in the 2017/18 annual report.	BC Centre for Disease Control, 2018
Pledges	The UK's Antibiotic Guardian Pledge program has been shown to increase awareness about antibiotic resistance among healthcare providers and patients.	Chaintarli et al., 2016
Primary-care interventions		
Educational programs targeting primary-care physicians	A two-day didactic educational seminar in France targeting physicians found decreased antibiotic prescribing four to six months later, compared with control.	Le Corvoisier et al., 2013
	Multifaceted educational programs targeting primary-care physicians have been linked to decreases in antibiotic prescribing. These programs often included online education or seminars. Systematic review evidence shows that multifaceted interventions are more effective than single interventions (AOR= 6.5, 95% CI 1.9 – 22)	Butler et al., 2012; Ferrat et al., 2016; van der Velden et al., 2012; Boonacker et al., 2010; McDonagh et al., 2018; Price et al., 2018
	Awareness campaigns that target physician prescribing for respiratory tract infections have been linked to decreases in antibiotic prescribing.	Cross et al., 2016
	There is medium-strength evidence that AMS interventions combining communication skills training and laboratory testing are associated with reductions in antimicrobial use.	Drekonja et al., 2015

Intervention Setting	Description	References
Primary-care interventions		
Feedback to physicians	One-time feedback on a physician's prescribing over the previous 12-month period resulted in an immediate 2% reduction in prescribing compared with pre-intervention, however over 12 months, there was a tendency to return to pre-intervention prescribing levels.	Naughton et al., 2009;
	Multifaceted AMS interventions targeting physicians that combine electronically-delivered feedback with education and decision-support tools have been found to be effective in reducing antibiotic prescribing compared with control groups (adjusted rate ratio 0.84, 95% CI 0.75 to 0.95).	Guilliford et al., 2018
	An RCT of social-norm feedback (feedback with comparison to peers) to physicians from the Chief Medical Officer of the UK has been shown to be effective at reducing antimicrobial use by approximately 4%.	Hallsworth et al., 2016
	An RCT of peer comparison, where emails were sent to clinicians comparing their rates of antibiotic prescribing to those of "top performers" reduced prescribing rates by approximately 5% compared with control.	Meeker et al., 2016
Electronic Health Records (EHR) Interventions	An EHR intervention evaluated by RCT that asked physicians to explicitly justify their reason for prescribing, and which, if no justification was given, added a note (visible to other practitioners) that said, "No justification given", reduced antibiotic prescribing by 7% compared with control.	Meeker et al., 2016
Shared decision making	An overview of systematic reviews showed that shared decision making reduces antibiotic prescribing compared with usual care (OR= 0.44, 95% CI 0.26 – 0.75).	Tonkin Crine et al., 2017
	A Canadian study showed that a tutorial on shared decision making for antibiotic treatment of acute respiratory infections in primary care led to a 50% reduction in the share of patients who decided to use antibiotics after consultation, compared with control.	Légaré et al., 2012
Vaccination	Adding the ten-valent pneumococcal conjugate vaccine (PHiD-CV10) to the pediatric vaccination schedule in Iceland significantly reduced the incidence of antibiotic prescriptions among children under three years of age compared with children born prior to introduction of the vaccine. The vaccine impact was 5.8% against all antimicrobial prescriptions, and 21.8% against acute otitis media-associated prescriptions.	Eythorssen et al., 2018
	Implementation of universal influenza vaccination was associated with a 64% decrease in influenza-associated respiratory antibiotic prescriptions in Ontario.	Kwong et al., 2009

Intervention Setting	Description	References
Primary-care interventions		
Delayed Prescriptions	Roughly half of GPs surveyed have found delayed prescribing to be a reasonable strategy for reducing antimicrobial use. Patients surveyed felt confident in deciding whether or not to use the prescription. Most patients surveyed (89%) would prefer to receive a wait-and-see prescription in a similar situation in future.	Hoye et al., 2011; McNulty et al., 2015; Raft et al., 2017; Ryves et al., 2016 Hoye et al., 2011
Guidelines	Development of guidelines for prescribing common antibiotics and circulation to all physicians and pharmacists in Quebec with a letter signed by key stakeholders (i.e. Minister of Health, College of Physicians, College of Pharmacists, and medical associations) decreased antibiotic prescribing relative to the rest of Canada. A study in Ontario showed that guideline adherence decreased substantially (61.4%) following a change in guidelines for first-line antimicrobial treatment for gonorrhea, and 16 months later had not yet regained the pre-intervention adherence rates, suggesting that passive guideline dissemination is not effectively reaching physicians.	Weiss et al., 2011 Dickson et al., 2017
Point-of-Care Testing	Systematic-review evidence suggests that point-of-care procalcitonin testing reduces initiation of antibiotics compared with control (OR= 0.10, 95% CI 0.07 – 0.14).	Tonkin Crine et al., 2017; Schuetz et al., 2017
Health system interventions		
Restricted Reimbursement	One Canadian study found that Alberta's special authorization policy for drug reimbursement significantly decreased the level of quinolone use for urinary tract infections (-33.6 95% CI -23.8 to -43.4) and upper respiratory tract infections (-16.1 95% CI -11.6 to -20.6) in people over age 65.	Manns et al., 2012

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Appendix A: PICO Criteria

Criteria	Inclusion	Exclusion
Population	The general public, patients, and practitioners/ prescribers (i.e. physicians, pharmacists, nurse practitioners, specialists) Healthcare system	Animal studies, Veterinary studies, Low-income countries
Interventions/ Exposures	Interventions targeted at the general public, patients, and/or practitioners (i.e. educational, including public awareness campaigns, decision support, training, feedback)	
Comparator(s)	No intervention or any type of comparator	
Outcomes	*Primary:* Misuse or overuse of antimicrobials *Secondary:* Patient outcomes (i.e. severity of symptoms, symptom resolution, disease duration and complication or adverse effects); Development of antibiotic resistance; Patient and/or provider knowledge, attitudes, or beliefs about antibiotic use; Patient adherence to prescribed antimicrobials; Patient participation in shared decision-making about antibiotic use; Patient satisfaction with care; Quality of patient-healthcare provider communication; Changes to regulatory practices or the practice environment.	
Study designs	Systematic reviews Case-control studies Cohort/longitudinal studies Cross-sectional studies Randomized controlled trials and/or cluster RCTs Economic assessments	Conference reports Editorials Letters Case series reports
Settings	Canada and OECD countries	
Quality assessment	Assessment by evaluating study designs	
Strategy for data synthesis	Tabular form using narrative synthesis methods	