

Making rational choices about how best to support consumers' use of medicines: a perspective review

Rebecca Ryan and Sophie Hill

Abstract: Inappropriate medicine use and polypharmacy create significant challenges for consumers and the health systems they live in, worldwide. In this review, we describe the evidence underpinning interventions directed primarily at healthcare consumers, including information provision, pharmacist-delivered interventions and practical supports, such as reminders to improve outcomes related to medicines. We identify a relatively small number of strategies that seem effective or promising: self-monitoring and self-management programmes, simplified dosing regimens and pharmacist-delivered interventions such as medication review. These interventions could be applied in practice to address some of the problems associated with inappropriate use of medicines, multimorbidity and polypharmacy. The evidence also indicates that success with many strategies is not consistent, suggesting that understanding the individual's context and their preferences will also be important for improving medicines' use. In addition, some strategies in current use are ineffective. Taken together, we argue that the evidence should inform deliberate, rational decisions between strategies to support consumers in using medicines safely and effectively. Future medicine-use research should likewise build rationally and constructively on what is known about promising interventions, avoiding duplication of past research, and working to help consumers negotiate the many challenges presented by polypharmacy.

Keywords: consumer participation, evidence-based medicine, medication adherence, polypharmacy

Introduction

Medicines are a cornerstone of treatment for many acute and chronic diseases, yet their safe and effective use by consumers remains a problem in health systems around the world. Preventable adverse effects, errors in prescribing and administration, and problems with medicine-related communication and transitional care are widely documented [Coulter and Ellins, 2006; Jokanovic *et al.* 2015; Schoen *et al.* 2005; Wilson *et al.* 2010]. Similarly, issues more directly related to medicine use by consumers (patients and family members or carers), such as problems with adherence, and the challenges that multimorbidity and concurrent polypharmacy (broadly defined as the taking of multiple medicines concurrently) present are well recognised [Farrell *et al.* 2015; Ryan *et al.* 2014]. Less than optimal

use of medicines is costly: for individuals who may fail to get the most benefit from their medicines or expose themselves to additional risks, and for health systems, where poor outcomes such as medication-associated adverse events and preventable hospitalizations can lead to substantial wastage of resources [Nieuwlatt *et al.* 2014; Reeve and Wiese, 2014].

Medicine use from a consumer perspective

Inappropriate medicine use has been described in many ways. Here, we define it broadly to include any situation in which a consumer fails to take a medicine as prescribed or directed. This might include failing to take medicines at the right time, in the right dose, or for the correct duration, or failure to take the medicine at all. This is a major

Ther Adv Drug Saf

2016, Vol. 7(4) 159–164

DOI: 10.1177/

2042098616651198

© The Author(s), 2016.

Reprints and permissions:

[http://www.sagepub.co.uk/](http://www.sagepub.co.uk/journalsPermissions.nav)

[journalsPermissions.nav](http://www.sagepub.co.uk/journalsPermissions.nav)

Correspondence to:
Rebecca Ryan, PhD
Centre for Health
Communication and
Participation, School of
Psychology and Public
Health, College of Science,
Health and Engineering,
La Trobe University,
Victoria 3086, Australia
r.ryan@latrobe.edu.au

Sophie Hill, PhD
Centre for Health
Communication and
Participation, School of
Psychology and Public
Health, College of Science,
Health and Engineering,
La Trobe University,
Victoria, Australia

problem: studies show that around half of people do not take their medicines as prescribed and almost all are occasionally nonadherent [Haynes *et al.* 2008].

At the other extreme, polypharmacy adds an overlapping set of problems related to medicine use. It is associated with more adverse events, poorer adherence and increased mortality [Farrell *et al.* 2015; Laroche *et al.* 2006; Smith *et al.* 2012]. Much research on polypharmacy has focused on improving the appropriateness of prescribing. Changes to prescribing practice, clinical guidelines and decision support for prescribers may all influence what and how medicines are given [Farrell *et al.* 2015; Grimshaw *et al.* 2001; Patterson *et al.* 2014]. Yet for many consumers the taking of multiple medicines is a daily reality, necessary for managing complex or multiple health problems. With rising rates of multimorbidity across both younger and older populations, polypharmacy and inappropriate medicine use are growing problems that urgently need to be addressed.

Since chronic, often multiple, medicines are used by and prescribed for so many people, we suggest here that finding the best ways to support the demands of these regimens, with minimal risk, is needed [May *et al.* 2009; Ryan and Hill, 2013]. In practical terms, this means that consumers must be sufficiently informed, skilled and supported to undertake the complex tasks related to medicine use. Strategies aiming to achieve these ends are therefore critical for improving the appropriate use of medicines.

The role of consumers as decision makers and managers of medicines

Many strategies exist to improve prescribing and medicine use, including those directed at health and financial systems, health professionals and consumers [Ryan *et al.* 2011]. Here, we suggest that of these broad approaches, one important way to tackle medication-related problems is to focus on consumers as managers of medicines, alone or in partnership with health professionals. We therefore focus here on consumers taking medicines, rather than on the health professionals prescribing or dispensing medicines. This is in alignment with the principles of patient-centred care and shared decision making.

Over the past decade, there has been growing recognition that consumers have an active part to

play in healthcare. The field of patient-centred care in particular has done much to promote consumers as active managers, and to articulate a central role for them as decision makers about health and treatment [Coulter and Ellins, 2006; Coulter *et al.* 2015; Dickinson *et al.* 2003]. This conceptual shift has been reflected in a reorientation from adherence, or lack thereof, to a wider range of outcomes for informed management of medicines [Ryan *et al.* 2014].

A more active role for consumers is also reflected by growing recognition that many factors affect how, and why people use medicines. This includes variables as diverse as perceived need for and cost of medicines, treatment preferences, and communication problems between patients and providers. Communication issues include shortfalls in medication reviews, inadequate information about how to take medicines, and lack of discussion about why medicines are needed [Britten *et al.* 2004; Munro *et al.* 2007; Pound *et al.* 2005; Tarn *et al.* 2006]. Since appropriate use of medicines involves a complex series of decisions and behaviours that can be interrupted at any point, strategies focusing on consumers as managers of their health might influence many of the factors affecting medicine use and to resolve related problems [Coulter and Ellins, 2006; Ryan *et al.* 2014].

Concentrating on interventions directed at consumers, we describe here how examining the evidence underpinning such strategies can, and should, enable rational choices between interventions to be made based on what seems to work, and what does not. We outline how effective or promising interventions might be applied to practice to improve medicine-use outcomes, identify strategies that are probably not effective or their effects unknown, and suggest that both practice and research can benefit from understanding the current state of evidence.

Improving medicine use and mitigating risk by targeting consumers

Interventions to promote more appropriate use can take many forms, reflecting the many problems that consumers encounter when using medicines [Haynes *et al.* 2008; Lowe *et al.* 2010; Reeve and Weise, 2014]. This includes practical strategies, such as reminders, aids, or outreach to assist with the practicalities of adhering to a regimen, or counselling on barriers to use. It might include educating people to enable informed decision

making, or training them with the skills needed to take medicines safely or to recognise when medicines are needed. The breadth and volume of research on such interventions is enormous, encompassing strategies with diverse aims, simple or complex in makeup, and delivered alone or in different combinations to target consumers, professionals or both [Ryan *et al.* 2011]. Such interventions may be able to reduce inappropriate use and to counteract the challenges of polypharmacy. However, the supporting research is spread across diseases, populations and settings, making it difficult to identify what might work, and what might not.

What strategies might improve medicine use?

Given the vast range of possible strategies and the huge body of research undertaken in this area, how can we decide which ones might improve appropriate use and reduce the risks of medicine use? One answer is to look at research from systematic reviews. This can help by synthesizing the findings from large numbers of studies to determine what the research evidence can tell us about the effectiveness or otherwise of these interventions across diseases and populations [Ryan *et al.* 2009]. It is critical to know which interventions improve outcomes, and those that do not, so that rational choices between strategies can be made.

We recently updated a Cochrane overview of systematic reviews in this area that summarised the results from 75 moderate-to-high-quality reviews [Ryan *et al.* 2014]. The overview assessed the effectiveness of a huge span of interventions, ranging from simple information pamphlets or reminders and packaging to complex decision support and pharmacist-mediated strategies. The findings can inform choices about those strategies that might be worth implementing, those worth investigating further, and those that seem ineffective. We suggest that these could in turn inform practice decisions about how best to improve medicine use and related outcomes, and to guide future research.

A summary of the effects of those interventions most likely to consistently improve a range of outcomes related to medicine use is presented in Table 1, together with suggested translations to practice. We report overall effects from numerous reviews against consumer-important outcomes of safe medicine use, adherence, clinical outcomes,

knowledge and adverse effects, showing both effective and promising strategies. ‘Effective’ means the intervention generally improves medicine-use outcomes, and ‘promising’ means the intervention is very likely to improve key outcomes but needs further study to be more certain about effects. ‘Outcomes’ here refer to categories of medicine-use outcomes, identified through conceptual work to develop a taxonomy that enabled synthesis of findings across reviews. We report results against these categories, together with specific examples of outcomes drawn from these groupings; our Cochrane review provides detailed methods [Ryan *et al.* 2014]. The overview included systematic reviews across populations of different ages, health problems and settings that strengthen the applicability of the evidence.

In the table, we report the key messages from the overview, indicating some important findings about the effectiveness of interventions focusing on consumers. Many (but not all) of the effective interventions were complex. This is noteworthy as it is often difficult to demonstrate the effectiveness of complex interventions.

Assembled, the body of evidence shows some important findings: there are selected strategies that consistently improve measures of medicine use. These include simple strategies, such as simplified dosing regimens, as well as complex approaches, for example the use of self-monitoring and self-management programmes. Such effective and promising strategies are most likely to improve a range of outcomes and so could be put to use to support more appropriate use and to counteract the risks of polypharmacy, as described in the table.

Strategies that don’t yet appear to work consistently

What is striking is that despite the huge investment of research in this area, few approaches are consistently effective. Medicine use might be improved through many different pathways, but effects across populations are still unclear for many interventions, and no single approach seems effective for everyone, or for all medicine use outcomes. Looking systematically at the research evidence enables identification of strategies where there is currently little evidence of effectiveness, uncertainty, or even evidence of ineffectiveness, so suggesting that alternatives might serve better in practice.

Table 1. Applying *effective* or *promising* interventions to improve consumers' use of medicines.

Effective or promising intervention	How this might be used in practice
<p>Generally effective</p> <p>Self-monitoring and self-management programmes</p> <p>e.g. Self-management of oral anticoagulant therapy (self-testing and self-adjusting therapy based on a predetermined dose schedule).</p> <p>e.g. Self-monitoring of oral anticoagulant therapy (self-testing and calling clinic for dose adjustment); home self-monitoring of blood pressure for people with hypertension.</p>	<p>Outcomes that improve with these interventions include:</p> <ol style="list-style-type: none"> (1) Medicine use (e.g. testing frequency, use of appropriate dose/medicine) (2) Adherence (e.g. blood medication level) (3) Adverse events (e.g. of medicines, withdrawals due to adverse events) (4) Clinical outcomes (e.g. thromboembolic events). <p>Collectively, this might improve the overall appropriateness of medicine use. People could be screened for willingness and ability to undertake medication self-management and self-monitoring, as not everyone is able to use or complete treatment. For those for whom the interventions might be appropriate, training in required skills, plus support, might promote adoption and continued use.</p>
<p>Promising interventions</p> <p>Simplified dosing regimens</p> <p>e.g. Decreasing frequency of daily doses; changing from liquid to tablet form.</p>	<p>By providing practical support for medicine taking, simplifying dosing regimens may improve:</p> <ol style="list-style-type: none"> (1) Adherence (e.g. pill count). <p>For those taking multiple medicines, simplification may be especially useful, reducing the demands of administering several concurrent medicines according to different schedules. Since it is not yet clear which is the best (most effective) simplified regimen(s), people should be asked for their preferences and views on what has helped them.</p>
<p>Pharmacist medication review</p> <p>e.g. Review to reduce number of medicines.</p>	<p>Medication review may improve several outcomes:</p> <ol style="list-style-type: none"> (1) Adherence (e.g. prescription refill) (2) Medicine use (e.g. medicine or device (e.g. inhaler) technique) (3) Medication problems (e.g. dose or medicine discrepancies, unnecessary medicines) (4) Clinical outcomes (e.g. systolic blood pressure). <p>This could help to reduce inappropriate medicine use associated with duplication, therapy continuation beyond what is needed, and reduce adverse events and problems with medicines. This may overcome some of the barriers to taking medicines (adherence). Pharmacist review could also help specifically to reduce polypharmacy by decreasing numbers of medicines in use; and to reduce the burden of polypharmacy by identifying medicines that are no longer necessary, contraindicated or duplicative in their effects.</p>
<p>Pharmaceutical care services</p> <p>e.g. Pharmacist consultation with patient to resolve problems, develop a care plan and provide follow up.</p>	<p>Pharmaceutical care services may improve:</p> <ol style="list-style-type: none"> (1) Adherence (e.g. missed doses) (2) Knowledge (e.g. knowledge of medicines and adverse effects, of health) <p>Improved knowledge of medicines, assistance to address medication problems and improved care continuity may all improve medicine use by addressing barriers and supporting adherence.</p> <p>Pharmaceutical care services might help to identify and resolve problems associated with polypharmacy, by helping people to understand their medicines, to identify adverse effects, and to reduce treatment burden by supporting adherence through development of a care plan tailored to need.</p>

The following interventions showed some positive effects, especially for adherence, but were less consistent in their findings across studies and need further research to clearly determine effects and identify reasons for variability. If these interventions are suitable or preferential for only some consumers, for instance, a reminder system or medication organiser, it suggests that pharmacists should remain vigilant for issues or advise people on the purpose(s) of medicines and how to adhere to treatment.

Interventions that typically improve some, but not all, medication-related outcomes are as follows.

- (1) Delayed antibiotic prescriptions: decrease antibiotic use, but have mixed effects on clinical outcomes, adverse events and satisfaction.
- (2) Practical strategies (reminders, cues, organizers, packaging, material incentives): show positive, but mixed effects on adherence.
- (3) Education plus other strategies (self-management-skills training, counselling support, training, or enhanced follow up); information plus counselling; or education and information as part of pharmacist-delivered care packages: have positive,

but mixed effects on adherence, medicine use, clinical outcomes and knowledge.

- (4) Financial incentives: have positive, but mixed effects on adherence.

These interventions therefore present a more complex picture, with mixed messages about effectiveness across relevant outcomes. Consumer preferences and discussion with the pharmacist would therefore be a critical part of decision making and management.

The assembled evidence also indicates that selected interventions may be ineffective for most medication-related outcomes. This includes:

- (1) directly observed therapy;
- (2) information or education delivered alone.

The latter strategy is ubiquitous but on its own may not affect adherence or clinical outcomes, although it may improve knowledge. The former is more often used for high-impact treatments such as antibiotics for tuberculosis, but has been shown in a recent update of trials to be no more effective than alternatives [Karumbi and Garner, 2015].

Choosing wisely to reduce the risks of inappropriate medicine use

Harnessing the enormous range and quantity of research to improve the safe and effective use of medicines can guide rational choices between strategies for application to practice. Although the answers are not entirely clear-cut, they can help by narrowing the field of possibilities to focus more deliberately on those for which there is good, or at least some, evidence of effectiveness.

The accumulated evidence on consumers' use of medicines can tell us much about what may work, but there is much to find out. Further research can be done in a targeted manner, informed by what we already know, rather than duplicating past efforts. This is critical, given the volume of research on medicine use and the relative scarcity of effective or even possibly effective interventions. Investigating ways to optimise those interventions that seem effective is one potentially productive direction. For instance, research to identify the most effective simplified dosing regimen(s) for combinations of high-use medicines seems very likely to be valuable. Similarly, linking promising strategies to new and emerging technologies, such as personal device-based delivery systems, may also hold potential to improve the effectiveness of promising existing

strategies, but needs rigorous evaluation. Further investigating those interventions with positive, but variable effects could also identify where difficulties lie for consumers and may lead to development of more effective strategies.

Considering a range of relevant outcomes is also critical to making sensible decisions about using such interventions in practice. For instance, of the interventions assessed, self-management or -monitoring interventions appear most consistently effective, yet a relatively high proportion of people may be unable to adhere to or use these strategies. In this case, people's ability to self-monitor is a critical determinant of the effectiveness of the intervention. Thinking beyond the traditional medicine-use outcomes such as clinical measures or adherence is absolutely essential if we are to better understand the impact of medicines in people's lives [Hill *et al.* 2011; Kaufman *et al.* 2015; Ryan *et al.* 2014]. This, in turn, is likely to enable interventions to more closely meet consumers' needs when it comes to better managing their medicines or dealing with the multiple demands of polypharmacy.

Conclusion

Looking across the research evidence on ways to support consumers' medicine use highlights that not all interventions are equally effective. This should inform both practice and research in this area. Encouraging the uptake of interventions that are most effective, and raising awareness of the limitations of those that are less so, or that appear ineffective based on what we know so far, provides a firmer, rational footing from which to address the challenges to health systems worldwide related to medicine use and rising rates of multimorbidity and polypharmacy.

Acknowledgements

The National Health and Medical Research Council provides support to both authors.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by a grant from the National Health and Medical Research Council [Cochrane Review Group Support 2013–2016].

Conflict of interest statement

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

- Britten, N., Stevenson, F., Gafaranga, J., Barry, C. and Bradley, C. (2004) The expression of aversion to medicines in general practice consultations. *Soc Sci Med* 59: 1495–1503.
- Coulter, A. and Ellins, J. (2006) Patient-focused Interventions. A review of the evidence. Available at: www.health.org.uk/publication/patient-focused-interventions (accessed 21 September 2015).
- Coulter, A., Entwistle, V., Eccles, A., Ryan, S., Shepperd, S. and Perera, R. (2015) Personalised care planning for adults with chronic or long-term health conditions. *Cochrane Database Syst Rev* CD010523.
- Dickinson, D., Raynor, D., Kennedy, L., Bonaccorso, S. and Sturchio, J. (2003) What information do patients need about medicines? *BMJ* 327: 861–864.
- Farrell, B., Tsang, C., Raman-Wilms, L., Irving, H., Conklin, J. and Pottie, K. (2015) What are priorities for deprescribing for elderly patients? Capturing the voice of practitioners: a modified Delphi process. *PLoS One* 10: e0122246.
- Grimshaw, J., Shirran, L., Thomas, R., Mowatt, G., Fraser, C., Bero, L. *et al.* (2001) Changing provider behaviour: an overview of systematic reviews of interventions. *Med Care* 39: II2–I45.
- Haynes, R., Ackloo, E., Sahota, N., McDonald, H. and Yao, X. (2008) Interventions for enhancing medication adherence. *Cochrane Database Syst Rev* CD000011.
- Hill, S., Lowe, D. and McKenzie, J. (2011) Identifying outcomes of importance to communication and participation. In: Hill, S. (ed.), *The knowledgeable patient: communication and participation in health*. Chichester: Wiley Blackwell, pp. 40–53.
- Jokanovic, N., Tan, E., van den Bosch, D., Kirkpatrick, C., Dooley, M. and Bell, S. (2015) Clinical medication review in Australia: a systematic review. *Res Social Adm Pharm* 12: 384–418.
- Karumbi, J. and Garner, P. (2015) Directly observed therapy for treating tuberculosis. *Cochrane Database Syst Rev* CD003343.
- Laroche, M., Charmes, J., Nouaille, Y., Picard, N. and Merle, L. (2006) Is inappropriate medication use a major cause of adverse drug reactions in the elderly? *Brit J Clin Pharm* 63: 177–186.
- Lowe, D., Ryan, R., Santesso, N. and Hill, S. (2010) Development of a taxonomy of interventions to organise the evidence on consumers' medicine use. *Patient Educ Couns* 85: e101–e107.
- May, C., Montori, V. and Mair, F. (2009) We need minimally disruptive medicine. *BMJ* 339: b2803.
- Munro, S., Lewin, S., Smith, H., Engel, M., Fretheim, A. and Volmink, J. (2007) Patient adherence to tuberculosis treatment: a systematic review of qualitative research. *PLoS Medicine* 4: e238.
- Nieuwlaat, R., Wilczynski, N., Navarro, T., Hobson, N., Jeffery, R., Keepanasseril, A. *et al.* (2014) Interventions for enhancing medication adherence. *Cochrane Database Syst Rev* CD000011.
- Patterson, S., Cadogan, C., Kerse, N., Cardwell, C., Bradley, M., Ryan, C. *et al.* (2014) Interventions to improve the appropriate use of polypharmacy for older people. *Cochrane Database Syst Rev* CD008165.
- Pound, P., Britten, N., Morgan, M., Yardley, L., Pope, C., Daker-White, G. *et al.* (2005) Resisting medicines: a synthesis of qualitative studies of medicine taking. *Soc Sci Med* 61: 133–155.
- Reeve, E. and Wiese, M. (2014) Benefits of deprescribing on patients' adherence to medications. *Int J Clin Pharm* 36: 26–29.
- Ryan, R. and Hill, S. (2013) Improving the experiences and health of people with multimorbidity: exploratory research with policymakers and information providers on comorbid arthritis. *Aust J Prim Health* 20: 188–196.
- Ryan, R., Kaufman, C. and Hill, S. (2009) Building blocks for meta-synthesis: data integration tables for summarising, mapping, and synthesising evidence on interventions for communicating with health consumers. *BMC Med Res Methodol* 9: 16.
- Ryan, R., Santesso, N., Lowe, D., Hill, S., Grimshaw, J., Pictor, M. *et al.* (2014) Interventions to improve safe and effective medicine use by consumers: an overview of systematic reviews. *Cochrane Database Syst Rev* CD007768.
- Ryan, R., Weir, M., Leslie, B., Worswick, J., Lowe, D. and Hill, S. (2011) Evidence on optimal prescribing and medicine use for decision makers: scope and application of the *Rx for Change* Database. *J Res Pharm Pract* 41: 295–299.
- Schoen, C., Osborn, R., Huynh, P., Doty, M., Zapert, M., Peugh, J. *et al.* (2005) Taking the pulse of health care systems: experiences of patients with health problems in six countries. *Health Aff* 3 November 2005; Web exclusives: W5-509–W5-525.
- Smith, S., Soubhi, H., Fortin, M., Hudon, C. and O'Dowd, T. (2012) Interventions for improving outcomes in patients with multimorbidity in primary care and community settings. *Cochrane Database Syst Rev* CD006560.
- Tarn, D., Heritage, J., Paterniti, D., Hays, R., Kravitz, R. and Wenger, N. (2006) Physician communication when prescribing new medications. *Arch Intern Med* 166: 1855–1862.
- Wilson, N., March, L., Sambrook, P. and Hilmer, S. (2010) Medication safety in residential aged-care facilities: a perspective. *Ther Adv Drug Saf* 1: 11–20.