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REVIEW

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Polypharmacy and sustainable developmental goals: linking evidence-based medicine, patient engagement, and shared decision-making

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Abstract

Sustainable Development Goals (SDGs) are an urgent call for action adopted by the United Nations to improve health and education, reduce inequality, and spur economic growth. The SDG 3 objective of good health and well-being is fundamentally linked to patient safety. Medication safety is a crucial issue in the promotion of health and well-being, and polypharmacy management is a key challenge in medication safety. Inappropriate polypharmacy can increase adverse drug events and health expenditures and reduce patient quality of life. As such, polypharmacy is prominent among older adults with chronic kidney disease. Optimal medication practice requires a high level of evidence-based medicine that integrates both scientific best evidence and patient values and preferences through a shared decision-making process. This article reviews polypharmacy management based on patient engagement and shared decision-making.

Keywords Polypharmacy, Evidence-based medicine, Patient engagement, Shared decision-making, Sustainable Development Goals

Introduction

Medication and pharmacological treatment play a central role in medical treatment. The discovery and application of insulin and antibiotics have saved millions of lives, and drug development of erythropoiesis-stimulating agents or hypoxia-inducible factor–prolyl hydroxylase domain inhibitors has improved the health status and quality of life of many patients with chronic kidney disease.

Global spending on prescription drugs in 2021 was approximately 1.42 trillion U.S. dollars and is expected to increase [1]. The World Health Organization (WHO) reports that half of all medications are inappropriately prescribed, dispensed, or sold, and that half of all patients fail to take their medication as prescribed [2]. Unsafe medication practices and medication errors are the leading causes of injuries and preventable errors worldwide. Up to 10% of hospital admissions are attributable to adverse drug events; 30 to 50% of them are avoidable [3]. Optimizing medication practices and reducing drug-related adverse events are crucial issues in patient safety and health economics.

Polypharmacy, which refers to the use of multiple medications, can increase adverse drug events and health expenditures and reduce patient quality of life, if managed inappropriately [4, 5]. Although there is no universally agreed-upon definition, polypharmacy is often defined as the routine use of five or more medications [4]. Polypharmacy management is critical for improving the

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quality and safety of healthcare. This article reviews polypharmacy management based on patient engagement and shared decision-making.

SDGs, medication safety, and polypharmacy

In 2015, the United Nations adopted "The 2030 Agenda for Sustainable Development," declaring a plan of action for peace and prosperity for people and the planet [6]. Sustainable Development Goals (SDGs) are an urgent call for action by all countries to improve health and education, reduce inequality, and spur economic growth. The 2030 agenda is comprised of 17 goals: (1) no poverty, (2) zero hunger, (3) good health and well-being, (4) quality education, (5) gender equality, (6) clean water and sanitation, (7) affordable and clean energy, (8) decent work and economic growth, (9) industry, innovation, and infrastructure, (10) reduced inequalities, (11) sustainable cities and communities, (12) responsible consumption and production, (13) climate action, (14) life below water, (15) life on land, (16) peace, justice, and strong institutions, and (17) partnerships to achieve the goals. Among these, goal 3 is concerned with health.

Although medication safety is not specifically mentioned in the SDGs, it is a major premise in achieving the third SDG and other SDGs. Recently, WHO has set global safety challenges to promote patient safety, and "Medication Without Harm" is the theme of the third Global Patient Safety Challenge [7]. Aiming to reduce medication-related errors, the theme was adopted at the Ministerial Safety Summit in 2017 and re-selected as the slogan for World Patient Safety Day 2022. Globally, medication errors cause harm and injury that are easily avoidable. Worldwide, 3–6% of all hospital admissions are attributed to medications, with admission rates of 2–19% in the USA and 11% in the UK [5]. To address this issue, WHO has published three technical reports on medication safety, among which is "Medication Safety in Polypharmacy," indicating that polypharmacy management is an important patient safety concern [4].

Polypharmacy can increase adverse drug events, drug–drug interactions, medication costs, medication non-adherence, and lower quality of life. Adverse drug events caused by polypharmacy may lead to additional drug prescriptions or prescription cascades. Polypharmacy is associated with poorer quality of life, higher healthcare expenditures, and a higher risk of morbidity and mortality [4, 5, 8–10].

Polypharmacy and chronic kidney disease

The prevalence of polypharmacy is estimated to be 10–20% in the general population and 40–60% in the older adult population [11]. Similarly, the prevalence of polypharmacy is higher among patients with chronic kidney disease who often have multiple comorbidities and multiple clinicians who prescribe medications independently. The prevalence of polypharmacy in chronic kidney disease (CKD) stage G4/G5 patients is reported to be 92% in a German CKD cohort and 91% in both a European Quality study and a Dutch study [12–14]. The prevalence of polypharmacy in 1117 participants with chronic kidney disease stages G3, 4, and 5 without renal replacement therapy in a Fukushima CKD cohort was 76.6% [15]. Among 2023 Japanese patients enrolled in the Project in Sado for Total Health (PROST), the prevalence of polypharmacy was 43%, 62%, and 85% in people without chronic kidney disease, non-dialysis-dependent CKD, and dialysis-dependent CKD, respectively [16].

In patients with chronic kidney disease, polypharmacy is associated with adverse drug events, mortality, kidney disease progression, and bone fractures. Kimura et al. investigated the association between the number of prescribed medications and adverse outcomes in 1117 Japanese chronic kidney disease patients [15]. They found that a high number of medications, especially more than 10, was associated with a high risk of kidney failure and cardiovascular events. Wakasugi et al. reported that hyperpolypharmacy (≥ 10 medications) is associated with an increased risk of fragility fractures, regardless of CKD status, and this risk has a strong impact on dialysis patients [16].

Polypharmacy and evidenced-based medicine

The causes of polypharmacy are multifactorial: an increase in the aging population with multimorbidity, advances in medical science and the development of new drugs, and physicians' pro-prescription attitudes. The biomedical model of healthcare naturally leads to polypharmacy when physicians try to solve multimorbid patients' complaints, symptoms, and abnormal laboratory values by prescribing multiple medications [4, 5, 11, 17]. Most clinical practice guidelines are focused on a single disease and rarely provide recommendations for patients with multimorbidity [18–20]. Clinical practice guidelines help clinicians to start new prescriptions but offer no advice on discontinuing or deprescribing current medication. Thus, a culture of overprescribing exists, where both physicians and patients seek medication to solve every problem [17].

Evidenced-based medicine (EBM), which emerged in the 1990s, is now a fundamental principle of the practice of modern medicine. It is a movement toward quality care where the best available evidence, rather than the authorities' or personal experience, is used to support clinical decision-making. When the movement started in

the 1990s, its initial focus was on clinical appraisal and use of published literature. Later, the evolving definition of EBM included not only the quality of the scientific evidence, but also the patients' personal values and clinicians' expertise [21–23]. It is not "cookbook" medicine, wherein physicians strictly follow the guideline recommendations; rather, it tailors best evidence to the values and preferences of a particular patient, guided by the clinical judgment of an experienced clinician [23, 24]. The current definition of EBM by Sackett is "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients," which integrates the best research evidence on hand with clinical expertise and patient values [24, 25].

EBM practice involves five steps: (1) generation of clinical questions; (2) finding the best evidence to answer the questions; (3) critical appraisal of evidence for its validity and usefulness; (4) application of evidence in clinical practice; and (5) evaluation of performance [26, 27]. EBM involves prioritizing a problem that is important to a patient from a multitude of problems. For example, a patient has disease-based problems, abnormal laboratory values, and psychosocial issues. Identifying the patient's important problems and generating clinical questions require the integration of scientific evidence, patient values, and experience through collaborative discussion. To elicit a patient's values, preferences, and concerns, building trusting patient–physician relationships is essential so that a patient can overcome anxiety and freely open up about their needs, fear, and preferences [17]. Figure 1 illustrates how patients' values and preferences are considered and applied in Steps 1 through 4 of the EBM process. Polypharmacy management needs to be conducted through the application of EBM, where patient engagement and shared decision-making take place.

Classification and management of polypharmacy

Polypharmacy can be beneficial or hazardous in the context of the patient's health status and should not be viewed as bad or unacceptable [5]. Optimal use of medication improves life expectancy and quality of life in patients with chronic kidney disease, diabetes, or cardiovascular disease, while inappropriate polypharmacy poses harm to patients and public health [4, 28]. Therefore, it is necessary to distinguish between appropriate and inappropriate polypharmacy.

Appropriate polypharmacy is defined as prescribing for an individual for complex conditions or for multiple conditions in circumstances where medicine use has been optimized and where the medicines are prescribed according to best evidence [4, 5, 28]. Inappropriate polypharmacy is defined as the inappropriate prescription of multiple medicines, or where the intended benefit of the medication is not realized [4, 5, 28]. Polypharmacy management is a whole systems approach which optimizes the care of multimorbid patients by maximizing benefit while reducing the risks of inappropriate polypharmacy [5]. This requires a systematic organization-wide approach involving all stakeholders. Key steps for

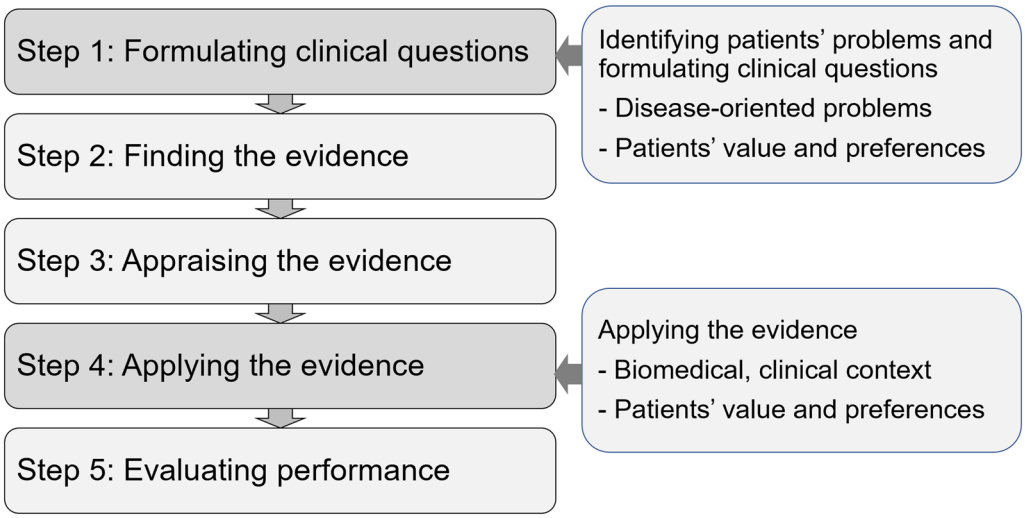

Fig. 1 Integrating patients' values into five steps of EBM. Identifying patients' problems and healthcare goals, and formulating clinical questions are the first key step of EBM. A patient and healthcare providers collaborate to identify the problem and to formulate questions. Applying the evidence is the fourth step of EBM, and again a patient and healthcare providers deliberate whether the guideline recommendations or the scientific evidence can be applied in the biomedical context and they match the patient's values and preferences

ensuring medication safety include (1) appropriate prescribing and risk assessment; (2) medication review; (3) dispensing, preparation, and administration; (4) communication and patient engagement; and (5) medication reconciliation at care transition, where polypharmacy management should be considered [5].

Various strategies for polypharmacy management include medication reviews, which are widely practiced [4, 5]. A medication review is a structured, critical examination of a patient's medicines with the objective of reaching an agreement with the patient about treatment, optimizing the impact of the medication, minimizing the number of medication-related problems, and reducing waste [29]. There are three types of medication reviews: a prescription review is a review of individual medication orders and/or prescription validity to minimize medication-related problems. A medication adherence review is a review of patients' compliance and medication-taking behavior. A clinical medication review is a comprehensive review of a patient's medicines in the context of their clinical conditions with the aim of reaching an agreement about treatment with medications, optimizing the effect of medication, and minimizing medication-related problems [29–31]. It is ideally conducted as collaborative work involving patients, physicians, and pharmacists [31, 32]. In this regard, pharmacists can play a key role in polypharmacy management; they have extensive knowledge of medications and understand more about medication interactions. Community pharmacists may notice patients' preference and concern on medications more than physicians.

Verdoorn et al., in their Drug Use Reconsidered in the Elderly using Goal Attainment Scales during Medication Review (DREAMeR) study, reported that a clinical medication review focused on personal goals improving patients' lives and well-being while decreasing the number of health problems that impact daily life, as well as the total number of long-term medications [30]. The clinical medication review is based on the Dutch Polypharmacy Guidelines for the Elderly and consists of five steps: (1) pharmacists interview a patient to identify the patient's health problems, preferences, and drug history and summarize health-related problems and goals. (2) All potential drug-related problems are summarized, and recommendations are proposed. (3) Pharmacists and physicians hold face-to-face discussions to propose care plans. (4) A pharmaceutical care plan is discussed with the patient and agreement is sought; and (5) Two follow-up meetings are scheduled to evaluate the implementation of the plan. The clinical medication review differs greatly from previous studies in that it focuses on patients' preferences and is approached through collaborative decision-making in which patients, pharmacists, and doctors work together to set goals.

Not all medication reviews are effective unless they are optimally implemented. To enhance the effectiveness of medication reviews, it is important to strengthen communication that enables multidisciplinary collaboration and information provision to patients [33].

Shared decision-making and polypharmacy management

Shared decision-making is a process of communication in which clinicians and patients work together to make optimal healthcare decisions. It requires the best medical evidence, clinician expertise in communicating and tailoring the evidence, and patient values, preferences, and concerns [34–38]. The agenda that shared decision-making endeavors to encompass is broad, including care that the person needs straightaway or care in future, such as advance care planning [35]. Polypharmacy management can be best practiced through the shared decision-making approach, and many guidelines and literature recognize that this approach improves patient adherence and patient outcomes, with regard to medication [5, 39–45].

Discontinuing inappropriate medication or prescription is a major component of polypharmacy management. There are many barriers to the implementation of deprescription at both the patient and physician level. Patients may worry about the negative results of deprescription, while physicians may feel uncomfortable prescribing medications recommended by clinical practice guidelines. Physicians may be reluctant to deprescribe due to fear of malpractice if deprescription results in poor outcomes. Moreover, discussing deprescription with patients is time-consuming, which is a difficult task in busy outpatient settings. Patients need to understand the effect of each medication on their life, whether the medication helps to achieve their life goals, and whether they need to inform the physician on any changes they experience after discontinuing the medication. Shared decision-making promotes patient–physician relationships and patients' understanding of suggested deprescription, leading to appropriate polypharmacy management.

The three-talk model proposed by Elwyn can be applied to polypharmacy. The three-talk model is a three-stage dialog consisting of team, option, and decision talk [36, 37]. In polypharmacy management, the process of selecting important problems from various problems such as patient complaints, symptoms, abnormal laboratory values, and psychosocial issues for both patient and the healthcare professional to discuss corresponds to team talk. Option talk is a discussion comparing the different options. For example, a patient with sleep disorders continues taking sleeping pills having compared

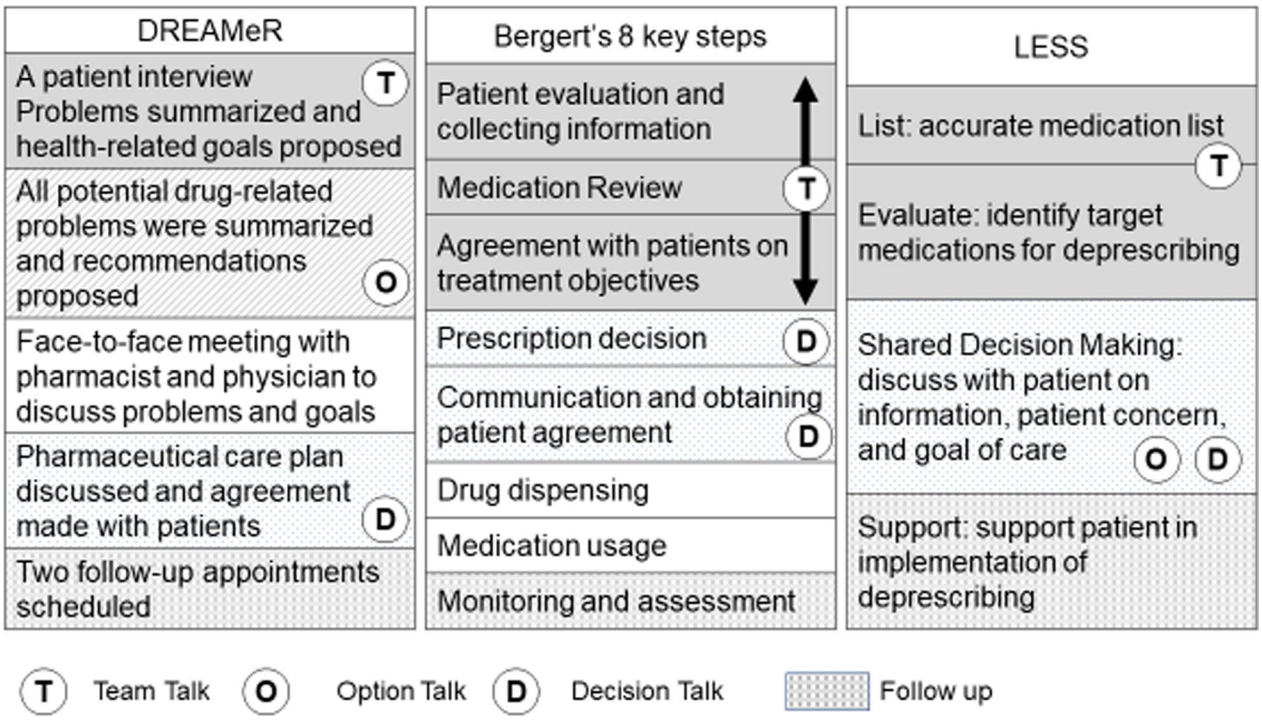

Fig. 2 Applying Elwyn's three-talk model into Mediation review process. Figure shows three clinical medication review approach. Major steps of clinical medication review can be seen as a part of Elwyn's three-talk model of shared decision-making. References [30, 46, 47]

the therapeutic modality to other methods. For patients with hypertension, diabetes, and cardiovascular disease, clinical practice guidelines recommend optimal blood pressure control with antihypertensives, including renin-angiotensin system blockers. Option talk includes a discussion of expected clinical outcomes and the risk of developing hyperkalemia. Adjusting dry weight in dialysis patients or the use of additional hypertensives is discussed between dialysis staff and patients. In decision talk, patients and healthcare professionals discuss whether a medication is essential to solving a problem that is important to the patient, while weighing the risks and benefits of medication, until a final choice is reached. Involving the patient in the polypharmacy management process by discussing the necessity of reducing the prescription, other measures after the reduction, and resuming the drug if the symptoms worsen after the reduction can promote understanding and consent of the patient, leading to the maintenance of a good physician–patient relationship and appropriate polypharmacy management.

Figure 2 shows how the three-talk model of shared decision-making corresponds to the polypharmacy management approach suggested by LESS for chronic kidney disease [46], the eight-step model proposed by Berget [47], and the DREAmer study [30]. This discussion flow enhances polypharmacy management at the moment of prescription in an outpatient setting or at the time of hospital discharge as a part of medication reconciliation. Figure 3 shows suggested algorithm for implementing deprescribing based on shared decision-making approach.

Future studies are needed to develop tools to enhance shared decision-making, such as patient decision aids and conversation aids. Evaluation of the effects of polypharmacy management interventions on patient outcomes and patient experience is also needed.

Conclusion

Polypharmacy is a major issue in patient safety, quality of life, and health economics, especially in patients with chronic kidney disease and undergoing dialysis. Evidence-based, patient-centered clinical medication reviews through a shared decision-making approach can facilitate polypharmacy management to achieve high-quality healthcare.

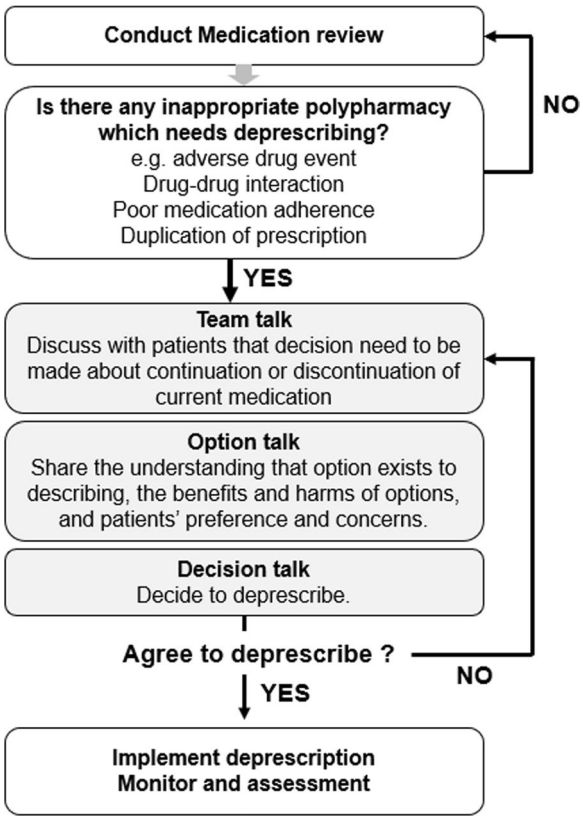

Fig. 3 Deprescribing algorithm using shared decision-making approach. Figure shows deprescribing algorithm using shared decision-making approach. Physicians or pharmacists can initiate deprescribing once they find that there is any inappropriate polypharmacy

Abbreviations

SDGs	Sustainable Development Goals
EBM	Evidence-based medicine
SDM	Shared decision-making
CKD	Chronic kidney disease

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YK participated in study conception, design and drafting of the article. All authors read and approved the final manuscript.

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Not applicable because this is a review article based on published works and publicly available data.

Declarations

Ethics approval and consent to participate
Ethics approval was not required because we only used published studies for this review. Informed consent is not required because no human participants or animals are involved.

Consent for publication
Not applicable.

Competing interests
The author declares that they have no competing interests.

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