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SPECIAL REPORT

Reducing potentially inappropriate polypharmacy at a national and international level: the impact of deprescribing networks

Emily G. McDonald[a,b,c], Carina Lundby[d,e], Wade Thompson[f], Cynthia Boyd[g], Barbara Farrell[h], Camille Gagnon[b], Jennie Herbin[b,c], Ninh Khuong[b], Frank Moriarty[i], Tiphaine Pierson[b,c], Sion Scott[j], Ian A. Scott[k], Jim Silvius[b,k,l], Anne Spinewine[m], Michael A. Steinman[n], Cara Tannenbaum[b,o], Johanna Trimble[b], Justin P. Turner[p] and Emily Reeve[p,q]

[a]Division of General Internal Medicine, Department of Medicine, McGill University Health Centre, Montreal, Quebec, Canada; [b]Canadian Medication Appropriateness and Deprescribing Network, Montreal, Quebec, Canada; [c]Centre for Outcomes Research and Evaluation, Research Institute of the McGill University Health Centre, Montreal, QC, Canada; [d]Clinical Pharmacology, Pharmacy and Environmental Medicine, Department of Public Health, University of Southern Denmark, Odense, Denmark; [e]Hospital Pharmacy Funen, Odense University Hospital, Odense, Denmark; [f]Department of Anesthesiology, Pharmacology, and Therapeutics, Faculty of Medicine, University of British Columbia, Vancouver, Canada; [g]Division of Geriatric Medicine and Gerontology in the School of Medicine, the Center on Aging and Health, and the departments of Epidemiology and Health Policy and Management at Johns Hopkins University in Baltimore, Baltimore, MD, USA; [h]Bruyère Research Institute, Department of Family Medicine, University of Ottawa, Ottawa, Ontario, Canada; [i]School of Pharmacy and Biomolecular Sciences, RCSI University of Medicine and Health Sciences, Dublin, Ireland; [j]School of Healthcare, University of Leicester, Leicester, UK; [k]Division of Geriatric Medicine, Cumming School of Medicine, University of Calgary, Calgary, Alberta, Canada; [l]Provincial Seniors Health & Continuing Care, Alberta Health Services, Alberta, Canada; [m]Louvain Drug Research Institute, Clinical Pharmacy Research Group UCLouvain, Brussels, Belgium; [n]Department of Medicine, University of California San Francisco and San Francisco Veterans Affairs Medical Center, San Francisco, California, USA; [o]Faculty of Medicine, Université de Montréal, Montréal, Quebec, Canada; [p]Centre for Medicine Use and Safety (CMUS), Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Parkville, Victoria, Australia; [q]Quality Use of Medicines and Pharmacy Research Centre, Clinical and Health Sciences, University of South Australia, Melbourne, SA, Australia

ABSTRACT

Introduction: Over the past decade, polypharmacy has increased dramatically. Measurable harms include falls, fractures, cognitive impairment, and death. The associated costs are massive and contribute substantially to low-value health care. Deprescribing is a promising solution, but there are barriers. Establishing a network to address polypharmacy can help overcome barriers by connecting individuals with an interest and expertise in deprescribing and can act as an important source of motivation and resources.

Areas covered: Over the past decade, several deprescribing networks were launched to help tackle polypharmacy, with evidence of individual and collective impact. A network approach has several advantages; it can spark interest, ideas and enthusiasm through information sharing, meetings and conversations with the public, providers, and other key stakeholders. In this special report, the details of how four deprescribing networks were established across the globe are detailed.

Expert opinion: Networks create links between people who lead existing and/or budding deprescribing practices and policy initiatives, can influence people with a shared passion for deprescribing, and facilitate sharing of intellectual capital and tools to take initiatives further and strengthen impact.

This report should inspire others to establish their own deprescribing networks, a critical step in accelerating a global deprescribing movement.

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Deprescribing; medication appropriateness; network; polypharmacy; medication overload

1. Introduction

Polypharmacy (often defined as more medications than clinically indicated) [1] is a global patient safety challenge [2,3]. It leads to drug–drug and drug–disease interactions and can be associated with worse adherence to medications. The more medications a person is prescribed, the more likely one or more will be potentially inappropriate [4,5]. Potentially inappropriate medications (PIMs) are medications with an unfavorable risk–benefit ratio and additionally, can add to a person's pill burden [6,7]. Over the past decade polypharmacy has increased dramatically in several countries [8–13]. Polypharmacy disproportionately affects older adults and people with complex chronic medical conditions (for example people with HIV or who are on hemodialysis); sex differences in polypharmacy trends have also been observed [12]. Several harms arise from polypharmacy and use of PIMs. For one, the risk of drug–drug and drug–condition interactions increases and can lead to adverse drug events (ADEs). Some PIMs contribute to falls, fractures, cognitive decline, loss of autonomy, and premature death. Other PIMs increase the risk of emergency department visits from ADes such as bleeding and hypoglycemia [14]. Still others are linked with rare outcomes that become significant when the medication is prescribed on a population level. A good

CONTACT Emily G. McDonald emily.mcdonald@mcgill.ca Division of General Internal Medicine, Department of Medicine, Centre for Outcomes Research and Evaluation, 5252 De Maisonneuve Boulevard, Office 3E.03, Montreal, Quebec H4A3S9, Canada

Article highlights

- Over the past decade, polypharmacy has increased dramatically. Measurable harms include falls, fractures, cognitive impairment, and death.
- Establishing a network to address polypharmacy can help overcome deprescribing barriers by connecting individuals with an interest and expertise in deprescribing and can act as an important source of motivation and resources.
- Networks create links between people who lead existing and/or budding deprescribing practices and policy initiatives, can influence people with a shared passion for deprescribing, and facilitate sharing of intellectual capital and tools to take initiatives further and strengthen impact.
- Over the past decade, several deprescribing networks were launched to help tackle polypharmacy, with evidence of individual and collective impact.
- Establishing a deprescribing network is a critical step in accelerating a global deprescribing movement.

example is that of proton pump inhibitors (PPIs), which are associated with rare ADEs that are important on a population level because the medication is so commonly overprescribed [15]. Although PPIs are usually intended to be prescribed for short courses of 2–8 weeks, they are often prescribed (in up to 40–50% of cases) for non-evidenced based indications, with failure to reassess whether there is an ongoing need [16]. Another concern is the cost to the payer. Billions of dollars are spent annually on PIMs on direct medication costs, which depending on the health care system, may be borne by the individual and/or government [17]. The cost increases even more dramatically when indirect costs such as ADEs are factored in. As health care systems are resource limited, this represents a huge opportunity cost due to this spending on low-value care [18].

For decades, the problem of polypharmacy has been highlighted by clinicians, educators, and researchers across multiple health disciplines [19]. The process of systematically reviewing and identifying medications that could potentially be stopped, tapered, dose reduced, or switched to a safer class is termed 'deprescribing' [20]. Publications on the topic range from shared decision making [21], to deprescribing guidelines [22–24], to clinical trials evaluating tools and processes to accomplish meaningful, safe, and sustained reductions in PIMs and polypharmacy [25]. Over the past decade, researchers and clinicians have mobilized to form networks, with the shared goal of reducing medication overload. The scholarly goal of a network is to connect, inform, and influence, and when operating well, allows specialists in a similar field to answer complex questions and clinical conundrums; networks can be an important source of motivation and can create and disseminate resources to overcome common barriers [26]. For example, most clinical practice guidelines do not address deprescribing. Networks have developed guidance to address barriers to deprescribing in clinical practice [22,23,27,28]. Herein we sought to describe four examples of Deprescribing Networks (Table 1), their composition and functioning, their individual and collective impact, with the goal of inspiring and guiding others to follow suit and launch their own networks. While not an exhaustive list, we aimed to provide a sampling of inspiring work taking place across the globe.

2. Networks examples

2.1. The Australian Deprescribing Network (ADeN)

In 2014, a growing interest in deprescribing research in Australia was recognized and a meeting was organized inviting researchers from Australia to present their work. Identifying the need for more research to address the growing problem of inappropriate medication use and medication-related harms, ADeN was then formed [51]. The aim of ADeN is to promote deprescribing research and translation to practice with the goal of improving safe and appropriate use of medicines for all Australians. The network provides support for academic researchers, clinicians, and other stakeholders to collaborate and develop the evidence-base, clinical guidance, and tools, with the end goal of reducing inappropriate medication use through optimizing deprescribing in practice. ADeN does not conduct any research or develop resources per se but is composed of individuals and teams doing so.

Over the first few years after formation, ADeN did not have a formal structure. It was led by a Chair who managed an e-mail list, and the responsibility for organizing the Annual Meeting was passed around to different individuals and teams across Australia each year [52]. A formal Executive Committee was formed in 2019; Executive Committee members serve defined terms and new members are elected via member vote. A Public Engagement Sub-Committee (PESC) was also formed to support activities related to member and community engagement, such as managing social media. Importantly, ADeN is a non-funded organization and work is done voluntarily without remuneration. Current activities include the Annual Meeting, a journal club/webinar series, website and social media, and involvement in advocacy and awareness initiatives.

The Annual Meeting is the cornerstone of ADeN's endeavors, offering a dynamic platform for sharing research, networking and reflection on the knowledge gains and trends in deprescribing research and where the field is moving to next. The Journal Club and webinar series was launched in 2020 for researchers across Australia to connect and network in an informal setting.

Following the formation of ADeN, members published on the term 'deprescribing' to raise awareness and expand the research field [30]. This was followed by development of a stakeholder driven set of recommendations for a National Strategic Action Plan for reducing inappropriate polypharmacy in older Australians [29]. Responses to dissemination efforts were received from government departments, universities, and other health-related organizations. Reactions included general support for the recommendations, plans to review curriculum, invitations for lead researchers to present on the work, and intention to disseminate further to relevant stakeholders and departments [32]. In 2023, ADeN was invited to partner with the Society of Hospital Pharmacists of Australia for the first

Table 1. Examples of deprescribing networks with sample activities, publications and resources.

Network	Funding	Sample Activities	Sample Publications from Members	Sample Resources
ADeN	Non-funded/ volunteer efforts	Website: https://www.australiandeprescribingnetwork.com.au/ Journal club Annual meeting Review and support grant applications Development of Recommendations for a National Strategic Action Plan to Reduce Inappropriate Polypharmacy [29]	Reducing inappropriate polypharmacy: the process of deprescribing [30]. A systematic review of the emerging definition of 'deprescribing' with network analysis: implications for future research and clinical practice [20] Patient barriers to and enablers of deprescribing: a systematic review [31] Impact of the Goal-directed Medication Review Electronic Decision Support System (G-MEDSS) on Drug Burden Index: A cluster-randomized clinical trial in primary care [32] Deprescribing to optimize health outcomes for frail older people: a double-blind placebo-controlled randomized controlled trial – outcomes of the Opti-med study [33]	The revised patients' attitudes toward deprescribing questionnaire [34] Goal-directed Medication Review Electronic Support System (G-MEDSS): https://gmedss.com/landing Deprescribing tools for clinicians and consumers [35] Polypharmacy indicators [36] Clinical Practice Guidelines for deprescribing opioids [37], cholinesterase inhibitors and memantine [38]
CADeN	Health Canada The Canadian Institutes for Health Research Accelerating Clinical Trials Consortium	Website: https://www.deprescribingnetwork.ca/ Journal club (international) Annual report Public presentations Research community of practice	Factors influencing the effects of policies and interventions to promote the appropriate use of medicines in high-income countries: A rapid realist review [39] Deprescribing benzodiazepine receptor agonists: Evidence-based clinical practice guideline [23] The MedSafer study – electronic decision support for deprescribing in hospitalized older adults: a cluster randomized clinical trial [40]	EMPOWER Brochures [41] A framework for integrating deprescribing into healthcare curricula [42] Deprescribing guidelines: https://deprescribing.org/ Resources to get a better night's sleep and deprescribe sleeping pills: https://mysleepwell.ca/ Deprescribing decision support: https://public.medsafer.org/public/start Translated deprescribing resources/patient handouts [43] (e.g. Arabic, simplified Chinese, Hindi, Korean, Punjabi, Tagalog, Urdu)
USDeN	United States National Institutes of Health	Website: https://deprescribingresearch.org/ Virtual work-in-progress seminars Annual meeting Webinars Stakeholder Engagement Annual Report Investigator development	Overcoming Inertia to Improve Medication Use and Deprescribing [44] Clinical Outcomes After Intensifying Antihypertensive Medication Regimens Among Older Adults at Hospital Discharge [45] Recommendations for outcome measurement for deprescribing intervention studies [46]	Grant opportunities Junior investigator intensive program Website resources for deprescribing study design
NERD	Non-funded volunteer efforts	Website: https://deprescribing.eu/ Webinars First international conference on deprescribing (ICOD 2022)	Health care professionals' attitudes toward deprescribing in older patients with limited life expectancy: a systematic review [47] The role of behavioral science in changing deprescribing practice [48] Special issue in Basic and Clinical Pharmacology and Toxicology Journal: Advancing Deprescribing [49] Measuring quality of life in deprescribing [50]	Hospital deprescribing implementation framework

Abbreviations: ADeN – Australian Deprescribing Network; CADeN – Canadian Medication Appropriateness and Deprescribing Network; USDeN – United States Deprescribing Research Network; NERD – the Network of European Researchers in Deprescribing.

'MedsAware: Deprescribing Action Week' (March 2024) [53]. Key activities included a webinar from the Chair of ADeN and a piece published in 'The Conversation' [54].

2.2. The Canadian Medication Appropriateness And Deprescribing Network (CADeN)

CADeN is as a group of patient advocates, educators, clinicians, decision-makers, and researchers working together to mobilize knowledge and promote appropriate prescribing in Canada. In 2014–2015, public grants supported the creation of CADeN; at the time, named the Canadian Deprescribing Network. In 2015, a strategic meeting brought together policymakers, patient representatives, and health care providers, where participants shared concerns around the growing issue of polypharmacy in Canada. Example activities are outlined in the network's first action plan, published in 2016 [55], and in 2017, members of CADeN published an ecological model to promote health system change to reduce PIM use [56].

CADeN structure and activities continue to evolve; currently it is composed of an executive committee and sub-committees (e.g. public awareness, health care provider, research, and an Indigenization working group). To bridge gaps in public awareness, CADeN launched a public awareness campaign in partnership with dozens of senior-serving community organizations across the country [57]. As part of the campaign, the network launched a public-facing website, DeprescribingNetwork.ca and a toolkit [58] to help members of the public learn about medication safety and deprescribing. The toolkit include articles, discussion tools, as well as patient educational deprescribing brochures [41,59]. To reach more Canadians, in 2022 CADeN initiated the translation of resources to many languages [43].

Recognizing the need for health care providers to be able to respond to patient requests, members created and widely distributed an evidence-based resource toolkit with links to deprescribing algorithms developed by the Bruyère Research Institute and the Ontario Pharmacy Evidence Network [23,24], evidence-based pharmaceutical opinions [59], posters, patient EMPOWER brochures [41], and educational videos [60]. The health care provider committee also crafted the first framework for deprescribing education for entry-to-practice medicine, pharmacy and nursing programs [42].

With respect to policy, CADeN published a rapid realist review of factors influencing the effects of interventions to promote the appropriate use of medicines, highlighting the importance of clear national strategies fostering prescribing appropriateness interventions, with some degree of central coordination done through national medicine agencies [39]. CADeN also put forward a 6-step national strategy for appropriate medication use for Canada [61]. This strategy proposed a national organization to coordinate and support evidence-based interventions with and for jurisdictions. Advocacy by CADeN resulted in medication appropriateness being integrated as a core stream of work in the newly formed Canadian Drug Agency (CDA) [62]. In 2023, renewable funding for CADeN was secured through Health Canada. CADeN is proud to lead and support research in medication appropriateness, with a growing community of over 60 research affiliates [63]. Large-scale trials led by CADeN researchers have studied interventions to reduce polypharmacy and PIMs [40,41,59,64–66].

2.3. The United States (US) Deprescribing Research Network (USDeN)

The USDeN [67] was founded in 2019 through a grant from the US National Institutes of Health (NIH), to catalyze and support interdisciplinary research on deprescribing in older adults by investigators in the US, and in partnership with colleague networks throughout the world. The network, co-led by academic geriatrician-researchers, is organized into a series of cores which correspond to key goals and activities of the network.

Investigator development is a central focus of the network and is achieved through several activities. The capstone event each year is a highly attended annual network meeting, open to all interested in research on deprescribing. Recent meetings attracted 130–170 participants and 50–70 poster presentations. Beyond the annual meeting, USDeN's Junior Investigator Intensive program enrolls 13–15 early-career investigators each year in a program of learning designed to enhance knowledge, skills, and collaborations. Rounding out investigator development activities is a webinar series and a robust website and social media presence designed to advance educational and community-building goals.

USDeN's pilot awards program funds 3–6 investigators each year to conduct pilot and exploratory studies related to deprescribing through a competitive selection process that includes reviewing proposals both for scientific merit and quality of stakeholder engagement [68]. In addition to regular pilot studies, supplementary funding obtained from the NIH has supported 4 large dementia-focused pilot awards as well as a special program that is supporting 4 clinical trial pilot studies using complementary and integrative health methods to support deprescribing of sedative-hypnotic medications including benzodiazepines.

Other activities have developed useful resources for the field. Working groups have addressed key questions in deprescribing science, including identifying high-value targets for deprescribing (under review) an expert consensus panel approach to identifying key measures for deprescribing studies [46], a multi-site collaborative to develop best practices for measuring sedative-hypnotic deprescribing using electronic health record data [69], and an ongoing project that is developing a framework for research on deprescribing communication. In addition, the network has compiled a series of resources including institutional review board and data safety monitoring plan guidance for deprescribing studies and a strategy for conducting literature searches on deprescribing.

Finally, stakeholder engagement is a cross-cutting principle of the network. A Stakeholder Engagement Council provides guidance on a range of network activities, including as noted above contributing to review of pilot award applications [68], and stakeholder perspectives are featured in educational programming including the national meeting and webinars.

2.4. The Network of European Researchers in Deprescribing (NERD)

NERD represents a collaborative effort to advance the science and practice of deprescribing across Europe, with the goal of improving patient care. NERD is primarily a network of researchers and was co-founded by pharmacists in 2019. At that time, the network was focused on Northern Europe only, as the network of Northern European Researchers in Deprescribing. NERD was launched through social media and grew organically with interested researchers joining through social media and the professional networks of the steering committee. By the end of 2021, the network expanded to include other regions of Europe. NERD is a non-funded network, currently relying on the voluntary participation of its steering committee and wider membership. NERD has recently developed a program for expansion of the network activities, with tailored strategies at the patient/public, health care professional, organizational and system levels, and has sought funding to support this.

NERD operates through a multidisciplinary approach, bringing together researchers, clinicians, and stakeholders from various fields to collaborate on deprescribing research and practice. NERD is led by a steering committee of researchers and clinicians in the field of deprescribing, representing seven European countries. NERD currently includes around 100 members from 12 European countries, including Belgium, Denmark, England, Finland, France, Ireland, the Netherlands, Norway, Scotland, Slovenia, Sweden, and Switzerland. The network aims to continuously expand its membership to stakeholders interested in deprescribing.

NERD functions by hosting mostly online meetings to foster exchange and collaboration among members. These gatherings serve as platforms for sharing research findings, discussing challenges, and exploring opportunities for advancing deprescribing. The network's first activity was a 'meet and greet' style series of seminars to showcase the depth and breadth of deprescribing research across Europe. For each seminar, researchers from countries represented in NERD's membership teamed up to showcase the deprescribing research happening locally. This enabled the network to 'map' existing deprescribing research and areas of expertise across Europe and has since led to several international collaborations. For example, this includes research led by NERD members, funded by USDeN and conducted in collaboration with members of the other deprescribing networks. NERD has a strong focus on deprescribing research dissemination and co-facilitates the International Deprescribing Journal Club alongside the other deprescribing networks, while the network also distributes news and updates from the other deprescribing networks. Finally, NERD secured funding for and organized the 1st International Conference on Deprescribing (ICOD) which was held in Kolding, Denmark, in September 2022, with 250 participants from all over the world.

3. Conclusion

Each of the networks described herein has unique structures, funding, and activities. All networks share a common goal of improving medication appropriateness and reducing unnecessary polypharmacy and PIMs. With differential funding models and funders, the scope and activities necessarily differ between networks, with for example, the USDEN focusing on research. Evidence of impact is emerging. On the patient level, networks have contributed to the promotion of medication appropriateness nationally. For example, in Canada, a reduction in the number of older adults prescribed PIMs was observed between 2014–2015 (47.8%) and 2021–2022 (42.3%) [70]; more specifically, this includes reductions in rates of long-acting sulfonylureas and benzodiazepines. Several tools and resources have also seen extensive uptake with adoption- and adaptation- by different health organizations worldwide. There has also been a substantial positive impact observed on deprescribing research. For example, in the US, in addition to providing direct funding and resources to a wide range of investigators and projects, network-supported investigators have published more than 700 papers relevant to deprescribing science and received more than 100 awards related to deprescribing. Other countries have begun to draw inspiration from the activities of the networks and national movements to improve appropriate prescribing are increasingly common. The authors of this special report hope to inspire others to form similar networks to improve prescribing globally.

4. Expert opinion

Over the past decade, individual countries and regions have created, nurtured, and grown deprescribing networks. Collectively, the networks are creating a social movement on deprescribing. Through activities such as public awareness campaigns, creation of clinical resources, capacity building, scholarly publications, funding for research, evidence generation and policy influence, the term deprescribing has drawn media attention, and entered colloquial language. The networks appear to be changing prescribing practices and empowering members of the public to be active participants in medication appropriateness efforts.

It should be noted that other deprescribing networks exist and are carrying out incredible work (e.g. the English Deprescribing Network, the Italian Scientific Consortium on Medication Review and Deprescribing) or are poised to take off (the German Deprescribing Network). For any other country or region that is considering launching a deprescribing network, there are several exciting advantages the approach offers:

(1) Spark: a network can generate interest, ideas and enthusiasm through information sharing, meetings and conversations with the public, providers, and other key stakeholders.
(2) Connect: building a network creates links between people who lead existing and/or budding practices and policy initiatives in deprescribing.
(3) Influence: bringing together a group of people with shared passion for deprescribing can be inspiring and steer the thinking and direction of activities to encompass meaningful goals.

(4) Facilitate: sharing intellectual capital and tools through a network can take initiatives further and strengthen impact.
(5) Accelerate: establishing and growing a network can move initiatives along faster.

One of the greatest examples of our collective efforts to promote change took place in September 2022, at the 1st International Conference on Deprescribing (ICOD), held in Kolding, Denmark. This conference brought together 250 participants from Europe, Asia, Australia, and North America. The conference was led by members of NERD with significant input and leadership from members of ADeN, CADeN, and USDeN. Further, there was attendance and representation from all networks on the scientific committee and among attendees, including a keynote session centered around the impact of deprescribing networks on the field. ICOD attendees included trainees, early career researchers, and senior researchers from all networks. The conference was successful through collaboration of the different networks across the world, which facilitated advertisement, participation, and submission of workshops and research presentations. The strength and breadth of networks contributed to the quality of the scientific program and the international representation of participants.

The success of the conference culminated in a special issue on deprescribing in the journal Basic & Clinical Pharmacology & Toxicology, which featured 25 papers related to the conference [49]. The networks are again collaborating to hold ICOD2 in Nantes, France in 2024. Members of the different networks are sitting on the scientific and planning committees for ICOD2 and are disseminating news and updates about the conference to the members. Based on feedback from the first ICOD, ICOD2 will, in addition to research, have a specific focus on clinical practice, aiming to also attract a growing number of clinicians. Over the next five years, it is expected that this international cooperative effort will facilitate sharing and discussion of real-world experiences with deprescribing and foster applied learning that can lead to increased confidence with and uptake of deprescribing in clinical practice.

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Declaration of interest

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