Adverse events experienced by homecare patients: a scoping review of the literature

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Abstract

Purpose. The paper summarizes the results of a scoping review that focused on the occurrence of adverse events experienced by homecare patients.

Data sources. The literature search covered published and grey literature between 1998 and 2007. Databases searched included: MEDLINE, EMBASE, CINAHL and EBM REVIEWS including the Cochrane Library, AGELINE, the National Patient Safety Foundation Bibliography, Agency for Healthcare Research and Quality and the Patient Safety Net bibliography.

Study selection. Papers included research studies, review articles, policy papers, opinion articles and legal briefs. Inclusion criteria were: (i) homecare directed services provided in the home by healthcare professionals or caregivers; (ii) addressed a characteristic relevant to patient experienced adverse events (e.g. occurrences, rates, definitions, prevention or outcomes); and (iii) were in English.

Data extraction. A pool of 1007 articles was reduced to 168 after analysis. Data were charted according to six categories: definitions, rates, causes, consequences, interventions and policy.

Results. Eight categories emerged: adverse drug events, line-related, technology-related, infections and urinary catheters, wounds, falls, studies reporting multiple rates and other. Reported overall rates of adverse events ranged from 3.5 to 15.1% with higher rates for specific types. Few intervention studies were found. Adverse events were commonly associated with communication problems. Policy suggestions included the need to improve assessments, monitoring, education, coordination and communication.

Conclusion. A standardized definition of adverse events in the homecare setting is needed. Prospective cohort studies are needed to improve estimates and intervention studies should be undertaken to reduce the risk that homecare patients will experience adverse events.

Keywords: home care services, adverse events, medical errors, patient safety, falls, infections

Introduction

Adverse events occur in all healthcare delivery settings. To date, most research has focused on patients in hospitals and other settings; whereas, much less has targeted patients in homecare. Despite the lack of adverse event research in homecare, it is reasonable to expect that adverse events occur in all homecare settings. In addition, in homecare the number and types of professionals who need to communicate with each other and the client and caregiver may be large and they may rarely meet [1]. When compared with acute care, we know that homecare services are delivered differently and in a less structured setting. This presents policy implications at both organization and system levels. For example, McGregor et al. [2] argue that organizations ‘need to recognize that the challenges and hazards that exist in delivering primary health care in the home are very different from those in bounded organizational settings such as hospitals’. Lang et al. [3] further suggest that addressing safety in home care will require significant changes in the ‘underlying institutionally oriented assumptions and guiding frameworks’. Lang and Edwards [4] may have best described the issue by suggesting that we need to consider the fact that the home is designed for living and not for healthcare services.

Further complicating the environment is the trend towards an increased reliance upon family or other unpaid caregivers with sufficient attention to educating or training them. This adds complexity and clearly differentiates homecare from acute care. Safety concerns related to characteristics of the homecare patients’ local community environment can also be associated with patient and caregiver safety [2]. Thus the more complex yet less structured nature of homecare...
suggests that variables associated with adverse events in homecare differ from other settings and that the potential for adverse events in homecare may be higher than for patients in acute care or other institutional settings.

Adverse events in homecare will continue to emerge as an important health policy issue for other factors that include increased demand and cost. We can expect to see the demand for homecare to increase and to be driven by a combination of both population and health system characteristics that include demographic changes, technological advances, healthcare system restructuring and policy shifts and consumer preferences [5, 6]. With the rise in demand, we will typically see cost increases. For example, with the exception of drugs, homecare expenses in Canada have increased more rapidly than all other healthcare expenditures [5, 7].

Given the above, we need a better understanding of adverse events in the context of homecare. A summary of what is known and not known about adverse events in different international settings can help decision-makers identify and prioritize patient safety policy. In this paper, we present an overview of a longer report on homecare safety commissioned in 2007 by the Canadian Institutes of Health Research, Institute of Health Services and Policy Research [8]. Scoping reviews are designed to address this need and are typically used to draw on the main findings of research to present an overview of what is known on specific topics and to identify research gaps [9].

We limited our focus to patients who were receiving care under the direction of a homecare organization. This decision was based upon a research need identified by an Ontario homecare provider and our belief that this would provide valuable information on the potential for direct harm to patients. Nevertheless, we acknowledge that the overall topic is broad and that adverse events in homecare could be experienced by patients, providers, caregivers and family. The next section describes the methods and is followed by an overview of our key findings.

Methods

Adverse events experienced by homecare patients were identified as a priority issue by three Community Care Access Centres that were responsible for organizing the delivery of homecare services to 15,000 active clients in Ontario, Canada [10]. In a research agenda setting meeting, the main research question identified was: what is known from the existing literature about the occurrence of adverse events experienced by patients in the delivery of homecare services? To address this question, we used the five-stage methodological framework for conducting scoping studies developed by Arksey and O’Malley [9]: (i) identifying the research question; (ii) identifying relevant studies; (iii) study selection for more detailed analysis; (iv) charting the data; and (v) collating, summarizing and reporting the results. The operational definition of adverse events applied in this study is a modified version of the one used by Masotti et al. [10]: ‘events or occurrences which become apparent during the delivery of home care services, and which have a negative impact on patient care, patient outcomes, family or support care and resources utilization’. Specifically, our focus was on the potential for harm to patients. Given this we excluded adverse events experienced by individuals other than the homecare patient.

Purpose

Our purpose was to map the extent and range of existing research and other relevant literature. In scoping review studies (unlike systematic reviews), researchers do not evaluate the quality of the studies. Scoping review studies are generally intended to draw on the main findings of research and to present an overview of what is known on the specific topic. O’Malley and Croucher [11] suggest that scoping reviews can be seen as a ‘preliminary attempt to provide an overview of existing literature that identifies areas where more research might be required’.

Data sources

The literature search covered indexed and unindexed published literature and grey literature during the 1998–2007 time period. Major databases consulted for the indexed published literature were: MEDLINE, EMBASE, CINAHL and EBM REVIEWS including the Cochrane Library and AGELINE. Additionally, the National Patient Safety Foundation Bibliography and the Agency for Healthcare Research and Quality and Patient Safety Net bibliography, both of which are dedicated specifically to the study of patient safety, were searched. Search strategies for each database were developed using natural language text words and controlled vocabulary terms specific to each database, I.E. MeSH, Emtree headings, Cinahl headings and Thesaurus of Aging Terminology headings for MEDLINE, EMBASE, CINAHL and Ageline, respectively. In addition, 13 journals, considered appropriate for homecare and patient safety, were searched manually. This was followed by a World Wide Web search using Google Advanced mode to identify relevant grey literature. The grey literature search was limited to Canadian content. We included both federal and provincial health ministry websites and major Canadian organizations involved in patient safety and homecare.

Data extraction

Papers eligible for review included research studies, review articles, policy papers, opinion articles and legal briefs. Specific inclusion criteria were: (i) homecare/healthcare related services provided in the home; (ii) services were provided by a healthcare professional or caregiver under the direction of homecare professionals; and (iii) addressed some characteristic relevant to adverse events experienced by patients (e.g. occurrences, rates, definitions, policy, prevention or outcomes). Papers were excluded if they (i) were non-English; (ii) did not specifically address patient-experienced adverse events; or (iii) addressed ambulatory/
out-patients or services generally not supervised by home-care. The purpose of the inclusion and exclusion criteria was to ensure that the papers addressed both care that was provided under the direction of homecare organizations and some aspect of adverse events experienced by patients. The timing of the adverse event (antecedent or outcome) including whether paid providers or caregivers were present was not part of the inclusion/exclusion criteria.

A preliminary pool of 1007 articles was identified using the search strategies. Titles and abstracts were reviewed using the inclusion/exclusion criteria and resulted in a total of 340 papers selected for full review in more detail. A detailed analysis of the 340 papers resulted in a selection of 193 papers that was further reduced to 168 following team adjudication of papers that were considered a questionable fit for the inclusion criteria. Data from the final 168 papers were charted according to the following categories: (i) definitions and types; (ii) rates (incidence/prevalence); (iii) causes; (iv) consequences; (v) interventions; and (vi) policy suggestions/implications. Where appropriate this data was further charted depending upon its specific relevance to patients, providers, healthcare organizations or the health system.

**Results**

In this general overview, we present the results in the following order: (i) definitions issues that emerged; (ii) studies reporting multiple adverse event rates; (iii) adverse event analysis categories that emerged from our analysis; (iv) prevalence/incidence rates; (v) causes; (vi) consequences; and (vii) interventions.

**Definitions**

An adverse event is a term that is used frequently in the literature. However, there does not appear to be a commonly accepted standardized definition for adverse events that occur in homecare. Differences in definitions used vary based upon outcomes such as the requirement for harm or increased resources utilization versus the potential for these to occur. Examples that illustrate the differences are in Table 1. The literature indicated a need for clarity and standardization regarding what truly constitutes an adverse event. For example, there are times when the same conditions exist (e.g. medication error, patient characteristics or other antecedents) but result in different outcomes (e.g. injury versus no observable injury). There also appears to be a lack of clarity regarding what is an adverse event and what is the consequence of an adverse event. For example, unplanned hospitalizations or emergent care have been both described as an adverse event and the consequence or outcome of an adverse event.

In the adverse drug event literature, we found that it was common to use the term adverse drug events when the focus was on the discussion or reporting of occurrences of problems such as polypharmacy or medication related errors such as: administration errors, wrong dose or inappropriate medications. This also highlighted issues relating to operational definitions of what constitutes an adverse event versus the antecedent or outcome of an adverse event.

**Studies reporting multiple/overall adverse event rates**

Comparing the adverse event rates reported in the different studies in each country presents challenges based upon study differences such as: (i) operational definitions for adverse events; (ii) the different adverse event types that were evaluated; and (iii) different patient populations. For example, the Australian studies evaluated hospital-in-the-home patients who may not have the same characteristics as Medicare/Medicaid patients in the USA. Table 2 illustrates the different adverse event types evaluated in three different studies.

Seven studies in three countries (one in Canada; three in USA; three in Australia) reported rates for overall or multiple adverse event types. Rates reported ranged from 3.5 to 15.1% [12–18]. Johnson [16] found a 5.5% rate in a random sample of 400 Winnipeg homecare clients. The American studies reported results of large sample studies that evaluated the Outcome and Assessment Information Set (OASIS) database that includes reporting for 13 specific adverse event outcomes for all Medicare/Medicaid homecare patients. In one example, Madigan evaluated the entire 2003 OASIS database comprising 3 013 287 patients and found a 13.1%
Table 2 Adverse event types evaluated in three studies in three countries

<table>
<thead>
<tr>
<th>USA—OASIS (Madigan [14])</th>
<th>Canada (Johnson [16])</th>
<th>Australia (Liu and Taylor [18])</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Emergent care for injury caused by a fall or accident</td>
<td>i. Injuries/falls</td>
<td>a. Allergic reaction to medication/dressing</td>
</tr>
<tr>
<td>2. Increase in the number of pressure sores</td>
<td>ii. Non-injury falls</td>
<td>b. Gastrointestinal side effects of medication</td>
</tr>
<tr>
<td>3. Emergent care for improper medication admin/side effects</td>
<td>iii. Pressure ulcers</td>
<td>c. Other</td>
</tr>
<tr>
<td>4. Substantial decline in management of oral medications</td>
<td>iv. Medication related</td>
<td>d. Post-operative wound infections</td>
</tr>
<tr>
<td>5. Unexpected nursing home admission</td>
<td>v. Mental harm/injury</td>
<td>e. Deep venous thrombosis</td>
</tr>
<tr>
<td>6. Emergent care for wound infections, deteriorating wound status</td>
<td>vi. Other</td>
<td>f. Haemorrhage due to anticoagulation</td>
</tr>
<tr>
<td>7. Emergent care for hypo/hyperglycemia</td>
<td>g. Failed diagnosis</td>
<td></td>
</tr>
<tr>
<td>8. Development of UTI</td>
<td>h. Failed treatment</td>
<td></td>
</tr>
<tr>
<td>9. Substantial decline in three or more ADLs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Discharged to the community needing wound care/meds assistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Discharged to the community needing toileting assistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Discharged to the community with behavioral problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Unexpected death</td>
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</table>

Overall rate [14]. Although these studies were not prospective cohort studies with extensive chart reviews, the results clearly suggest that adverse events occur frequently and the American studies also suggested that rates for some types are similar across time and different locations (Table 3).

Adverse event analysis categories

We identified eight thematic categories that were distinct enough to warrant category-specific analyses. Six categories address specific adverse event types, whereas the remaining two categories were broader in scope. We acknowledge that other appropriate categories exist and that the categories we identified may not be mutually exclusive. The number of papers per category are: (i) adverse drug events (42), (ii) line-related (33), (iii) technology-related (16), (iv) infections and urinary catheters (11), (v) wounds (10), (vi) falls (7), (vii) studies reporting multiple/overall rates (7), and (viii) other (42).

Category definitions/criteria

Adverse drug events are typically defined as injuries resulting from medical interventions relating to the use of a drug [19]. The line-related adverse event category included adverse event associated with medical interventions that included the insertion of a line through the skin and other tissue. Examples of three commonly reported line-related adverse events include: (i) line/catheter occlusion; (ii) catheter site infections; and (iii) catheter-related blood stream infections [20–42]. Technology-related adverse events are associated with the use of medical equipment and technology used to deliver health care and include oxygen therapy, ventilators, dialysis and equipment/computer operational failures [43–55]. Adverse events in the infections and urinary catheter-related category excluded line-related and wound-related infections. Examples of three commonly reported adverse events in this category were urinary tract infections (UTIs), community-acquired pneumonia and hospital-acquired infections [7, 33, 34, 56–60]. Adverse events in the wounds category were associated with disruptions in structural integrity and included surgical, burns, infections, pressure-echars and vascular-leg ulcers. Falls were adverse events associated with injury caused by unplanned movements to the ground or another plane [61]. Papers in the other adverse event category typically addressed topics that include healthcare policy, legal issues, general patient safety and reporting and data collection. Papers in the multiple/overall rates category evaluated patient populations for multiple types of adverse events that typically were not limited to a specific adverse event type such as adverse drug events.

Prevalence/incidence rates

The previous section, ‘studies reporting multiple/overall adverse event rates’, was limited to seven papers and did not provide an adequate description of what the literature revealed about adverse event rates in homecare. Table 4 illustrates specific rates. The following provides a general overview of results for the specific analysis categories. The prevalence estimates given below should be interpreted with caution because of variations in study design and sampling.

Adverse drug events and line-related adverse events were the most frequently reported and had the highest proportion of events. Johnson [16] found that adverse drug events represented 23.1% of all adverse events in a sample of Canadian homecare clients, whereas the Joint Commission on Patient Safety indicated that 20–30% of homecare patients were at risk for medication errors and that when errors occurred in the home, 12% of the patients...
experienced harm (Note: reported medication error rates, which do not always result in adverse events, ranged from 19 to 77%) [62–71]. The most frequently reported types of line-related adverse events were catheter-related bloodstream infections, catheter site infections and line/catheter occlusions. There were fewer studies that reported adverse event rates for the remaining categories. However, Johnson [16] found that falls represented 61% of all types of adverse events experienced and that 46% of falls resulted in injury. When discussing wounds, Madigan [14] suggested that 60% of homecare referrals required wound management. In addition, a 20% point prevalence wound rate has been reported [72]. Infections also occur frequently. For example, Mananaga et al. [33] reported that 16% of the 5148 homecare patients in their study had infections during the study period and that 8% of those were homecare acquired and of the infections 50% were UTIs and 37.9% were skin infections. In another study, Patte et al. [58] reported a hospital-acquired infection rate of 6.3/100 in sample of 376 homecare patients. In addition, home ventilator use was associated with predictable equipment failure rates [43, 44]. This suggests that other technology-related adverse event rates may also be predictable given that both human error and equipment failure are likely to occur.

Causes

Our methods included the assumption that factors associated with the cause or increased risk of adverse events could be grouped into two broad categories: (i) patient-level characteristics (includes patient, home environment and caregiver/family) and (ii) healthcare organization and system-level characteristics. Our definition of healthcare organizations included homecare agencies and their associated staff, and other clinical providers who work with patients. Many papers in all adverse event analysis categories provided information (both evidence based and opinion based) that addressed causes of adverse events.

Table 3  Adverse event rates in two American studies

<table>
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<tr>
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<tbody>
<tr>
<td>Emergent care for injury caused by a fall or accident</td>
<td>1.7</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Emergent care for wound infections, deteriorating wound status</td>
<td>1.9</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Emergent care for improper medication admin, medication side effects</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Emergent care for hypo/hyperglycemia</td>
<td>0.6</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Development of UTI</td>
<td>1.1</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Increase in the number of pressure ulcers</td>
<td>0.4</td>
<td>1.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Substantial decline in 3 or more ADLs</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>Substantial decline in management of oral medications</td>
<td>0.5</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>Unexpected nursing home admission</td>
<td>3.9</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Discharged to the community needing wound care or medication assistance</td>
<td>0.5</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Discharged to the community needing toileting assistance</td>
<td>0.2</td>
<td>0.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Discharged to the community with behavioral problems</td>
<td>0.8</td>
<td>0.9</td>
<td>0.4</td>
</tr>
<tr>
<td>Unexpected death</td>
<td>1.1</td>
<td>3.4</td>
<td>1.0</td>
</tr>
</tbody>
</table>


Patient-level characteristics. Commonly reported patient-level characteristics associated with cause or increased risk were (i) increased age and co-morbidities [14, 15, 18, 56, 58, 61, 63, 66, 67, 73–80]; (ii) gender [14, 66, 67, 81]; (iii) depression, cognitive impairments, functional status/limitations [14, 56, 58, 62, 64, 66, 67, 73, 80–88]; (iv) patient compliance [73, 80, 82, 83, 89–91]; and (v) living alone or no caregiver [63, 65, 67, 80, 92].

Organization and system-level characteristics. Across the literature it was clear that communication issues (including patient education) and/or local system-level integration issues, such as coordination and collaboration, were believed to be associated with the primary causes of adverse events [14, 16, 56, 63–65, 73, 75, 80, 82, 86, 87, 89, 91–105]. Other commonly reported factors associated with cause or increased risk included: (i) team experience, training or knowledge [74, 79, 84, 87, 92, 100, 103, 106–108]; (ii) team workload [73, 74, 99, 103, 106]; (iii) medication errors [19, 62, 70, 73, 85, 89, 92, 108]; (iv) unrecognized polypharmacy [63, 65, 66, 85, 86, 92]; (v) drug label instructions [87, 88, 100]; and (vi) inadequate patient monitoring/assessment [63, 67, 74, 87, 100, 102, 108].
**Consequences**

As expected and aligned with the different definitions for adverse events, reported consequences exist on a continuum that can range from barely observable occurrences to those that have high health and economic costs. Examples of health consequences include functional loss or decline, illness, temporary injury/pain, permanent injury/harm, and death [13, 16–18, 21, 25, 28, 31, 35, 39, 56, 59, 63, 70, 73, 74, 80, 88, 92, 104, 105, 108–115]. Economic consequences include increased need for treatment or care, increased patient or caregiver time and unplanned hospitalization [16–18, 20–22, 24, 27, 28, 31, 35, 36, 42, 56, 59, 73, 80, 81, 101, 102, 105, 110–119]. In addition, in the Canadian study that evaluated multiple adverse event rates, Johnson [16] reported that 69.3% of the adverse events resulted in temporary harm, 4% in permanent harm, 4% in permanent placement and 15.4% resulted in unneeded hospitalizations. Franklin [74] also suggested that harm is more likely to result from adverse events associated with intravenous errors because of the immediate absorption of the drug and the inability to recall it after it is given. Whereas, Fortinsky found that 9% of homecare patients were hospitalized due to wounds (compared with 7% for falls, the next most frequent cause). Fortinsky [120] also reported that the odds of being hospitalized were much higher for a homecare patient with a wound versus one without.

Other reported consequences of interest include the following: (i) burns associated with patients on oxygen therapy who smoke [121]; (ii) patient initiated lawsuits [53, 98]; (iii) delayed therapy [22, 28, 118]; and (iv) increased emergency room visits for patients on ventilators, home oxygen and suction machines following power outages [119].

**Interventions**

To be identified as an intervention, the main criteria used was the requirement that the article discussed or presented evidence of a formal program that was designed with the objective of identifying adverse events, decreasing rates or reducing their impact.

Our analysis revealed an abundance of policy or best practice suggestions regarding preventing adverse events; however, there was a paucity of actual intervention models or intervention effectiveness studies. For example, we only found a total of 18 interventions documented in five of the eight categories: adverse drug events (4); line-related adverse events (3); wounds (2); falls (4) and other adverse events (5). However, many of the examples we included did not meet full inclusion criteria for our operational definition of interventions.

Characteristics of intervention models the authors considered successful or potentially effective included (i) improving staff knowledge and training; (ii) increased patient monitoring and reporting by providers; (iii) use of computerized screening to identify potential adverse drug events; (iv) implementing required standardized reporting; (v) improved collaboration/communication between local providers (acute care, primary care and homecare); (vi) using an appropriate
interdisciplinary team mix; (vii) focus on both patient (includes home and caregivers) and provider level characteristics; and (viii) targeting identified adverse events for further comprehensive investigation into patient-level and provider-level characteristics [13, 15, 31, 60, 65, 72, 76, 78, 86, 89, 102, 122–125].

Conclusions

Implications

Our findings are the result of a comprehensive five-stage structured approach to conducting a review of the body of English language indexed and unindexed literature that was published/made available during the 1998–2007 time period. Our scoping review identified six key categories of events recognized in the published literature: adverse drug events, line related, technology related, infections/urinary catheters, wounds and falls. Although these categories were the ones that emerged from our review, we recognize that other appropriate categories or sub-categories exist. Given this, we suggest that a better understanding of adverse events in homecare would result from research that utilizes a typology that places similar adverse event types into appropriate categories for evaluation based upon shared characteristics (e.g. biological, causes, outcomes, patient subpopulations, provider-level characteristics and treatment type). For example, gender-based analyses would be appropriate given that women live longer and consequently may have the unfortunate experience of transitioning from caregiver to patient.

A second finding of this study relates to the relatively small international body of evidence addressing overall adverse event incident and prevalence rates. The results of our scoping review suggest that it is reasonable to conclude that adverse events in homecare occur frequently and with some degree of predictability for specific types. However, one should not interpret the results to reflect the true experience of homecare patients in multiple homecare settings. This assertion is based upon the following: (i) few studies reported rates and evaluating the quality of those studies was outside of the scope of this scoping review study; (ii) none of the studies were large sample prospective cohort studies; (iii) different adverse event definitions were used and studies did not evaluate the same groups of adverse event types; and (iv) some adverse event types still need to be identified and defined before they can be documented. Given this, we hypothesize that the actual rates experienced by homecare patients could be higher. Consequently, we suggest that measuring the rates of adverse events in homecare settings should be considered a priority health policy issue.

One conclusion from our research was that policy aimed at preventing or reducing the impact of adverse events will need to target multilevel changes (e.g. patient, caregiver, home environment, provider, organization and healthcare system levels). The literature clearly indicated that between and within organization communication issues (includes patient and caregiver education), provider education and local health system-level integration issues were perceived to be associated with primary causes of adverse events. There is a clear need for a system-level approach that includes increased focus on caregivers and the home environment. In addition, system-wide initiatives that will support the continued ability to understand adverse events and improve patient safety include: (i) acceptance and implementation of a standardized definition for adverse events and for specific adverse event types; (ii) required data collection and reporting of specific adverse events; and (iii) system-wide surveillance. However, effective policy will require more knowledge and consequently, more research.

Research needs

In general, there is a need for multiple large sample cohort studies designed to improve our understanding of characteristics associated with the occurrence of adverse events. Ideally, this research would increase our understanding of rates, risks and outcomes for specific adverse event types in different homecare subpopulations and under different models of delivery. This research should evaluate patient-level, provider/organization-level and local healthcare system-level factors associated with adverse events as well as the relationships between the different levels.

This scoping review study revealed three primary research areas that need to be addressed to increase our knowledge about adverse events in homecare: (i) incidence rates (e.g. for multiple adverse event types and homecare patients with different characteristics); (ii) multi-level variables associated with the occurrence of adverse events (e.g. patient/provider/system-level variables associated with causes and consequences); and (iii) information on effective interventions and best practices (e.g. to identify, prevent or reduce the impact of adverse events). However, a first step in effectively approaching these research areas would be the development and acceptance of a standardized definition for an adverse event and for specific adverse event types.

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