

Investigating adverse events in long-term care facilities: a systematized review



Review

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Abstract: Objective: This systematized review aimed to synthesize the results of empirical studies focused on the types and factors of adverse events (AEs) that contribute to them in long-term care (LTC) settings.

Methods: The search was conducted in ProQuest, Scopus, and PubMed in January 2021 and resulted in 1057 records. The content analysis method was used in the data analysis.

Results: In all, 35 studies were identified as relevant for the review. The analysis revealed 133 different types of AEs and 60 factors that contributed to them.

Conclusions: In LTC, various AEs occur, most of which are preventable, while many factors that influence their occurrence could be significantly modifiable. Through an effective analysis of AEs in LTC, it is possible to minimize their occurrence and, at the same time, minimize their negative impact on all parties concerned.

Keywords: adverse event • facility • factors • long-term care, healthcare workers

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1. Introduction

Adverse events (AEs) are significant indicators of quality of care and patient safety. In the literature, AEs are defined in many ways, most often as unintended injuries or complications related to the management of health-care provision and, at the same time, result in patient mortality, disability, unplanned, or prolonged hospital stay.¹ The definitions of AEs largely reflect physical harm or injury to the patient. However, the patient's living experience is considered in broader definitions. An AE could be understood as suffering, physical or emotional

impact, illness, or death, in which many of these consequences could be preventable if necessary actions were adopted during direct patient contact with healthcare givers.² AEs occur in all healthcare systems, whereby the risk of their occurrence increases with the number of surgeries, examinations performed, or applied treatment. Moreover, in addition to direct harm to patients, AEs are a financial burden to any health system.¹

Given the current trend of an aging population, long-term care (LTC) is becoming more and more

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important. The occurrence of AEs is higher in LTC facilities compared with acute care facilities.³ Elderly patients, respectively, residents of LTC facilities, are at increased risk of AEs due to deterioration of their health status, polymorbidity, and reduced contact with relatives.⁴ One of the critical aspects of improving resident safety is an AE reporting system, which includes identifying AEs and their underlying causes and contributory factors. Reporting AEs also supports safe and quality care.⁵ Unfortunately, due to various barriers to reporting AEs, such as fear of punishment, lack of organizational support, or lack of motivation to report AEs, the number of reported events is much lower than the number that occurs.⁶ Furthermore, no recommended reporting system is recognized internationally; therefore, there are discrepancies in reporting AEs in different countries. It is necessary to raise awareness of various methods to effectively report AEs, even for the management of LTC facilities.⁴

Research on AEs in LTC facilities has focused primarily on falls and medication errors.⁷ Studies of medication errors, including overdosing, have been justified by the belief that residents of LTC facilities are exposed to more errors due to the increased use of medications and that such patients are more vulnerable to the potential consequences of these errors. These studies also highlighted adverse drug events as a frequent problem in LTC facilities.⁸ Among the AEs that most jeopardize residents' safety, pressure ulcers and infections could be evidenced in LTC facilities more recently.^{9–11} Less frequently reported AEs, which threaten residents, are preventable death, fractures, impaired nutritional status, dehydration, or accidental injuries.^{9,10,12}

Most reported AEs, which lead to deterioration in the physical or mental health of residents, are the result of neglecting fundamental nursing care activities, such as turning, feeding, hygiene care, or surveillance.¹⁰ Many AEs are the result of inadequate or rationed nursing care.⁴ In addition, other factors contribute to AEs in LTC facilities, and poor training of healthcare professionals is one of the most critical. Healthcare professionals in LTC frequently use manipulation, infantilism, raised voices, insults, or quarrels in communication with residents.¹³ However, older people perceive these manifestations more sensitively, leading to increased social isolation and loneliness, a decreased quality of life, and premature death.¹⁴ Furthermore, the values of healthcare professionals, the loss of empathy, professionalism, or freedom to share opinions with the manager, followed by burnout syndrome and emotional exhaustion, but also insufficient knowledge or skills might lead to compromised care, which often results in errors or AEs during the care provision.^{15,16} Compromised care

is also associated with organizational factors, such as inadequate staff numbers, ineffective work organization, inadequate teamwork, and inappropriate work conditions that may also contribute to AEs as well.^{10,11}

Recent reviews have focused on the topic (AEs and contributing factors), especially in home care,¹⁷ identifying interventions for prevention^{18–21} or examining the specific AEs, such as falls²² or medication errors.²³ Furthermore, Okpalauwaekwe and Tzeng³ in their scoping review, analyzed the contributory factors to AEs among older adults during short stays in skilled nursing facilities and found extrinsic contributors related to capacity and opportunity, shedding light on areas that warrant further research. AEs in LTC remain hidden problems and are still overlooked. Considering the trend of the aging population, AEs and their contributing factors should be noted and summarized to be addressed by the management of LTC facilities, in order to improve the safety of residents and improve the quality of care in these facilities. Therefore, our review focuses on LTC, including rehabilitation, curative, nursing, or palliative care; reports how AEs were studied in the literature; and analyzes various types of AEs along with factors that may influence their occurrence in LTC facilities.

2. Methods

2.1. Aim

This systematized review aimed to collate the existing empirical research literature on AEs in LTC facilities, to describe the types of AEs and factors that contribute to them in LTC facilities. The aim was specified by the following research questions:

1. What methods were used to study AEs in LTC facilities?
2. What types of AEs occur in LTC facilities?
3. What are the factors that affect the occurrence of AEs in LTC facilities?

2.2. Design

A systematized review design was selected, with the inclusion criterion that AEs are the key target of the reviewed studies. A systematized review allows following a systematic approach to search, retrieve, extract, and analyze the available literature without excluding studies based on their methodological quality.²⁴ The systematized review was carried out according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Checklist (PRISMA checklist).²⁵

2.3. Search protocol

The search was carried out in January 2021 in 3 scientific databases, PubMed, ProQuest, and Scopus, based on their institutional availability. The search was carried out using both mesh terms and different combinations of keywords that refer to AEs and LTC. The search is shown in Table 1. The search was limited to language (English); however, no time limits were determined. The predefined criteria were stated. The study was included if it: (a) was an empirical study (qualitative, quantitative, mixed-method); (b) was published in a peer-reviewed journal; (c) was published in the English language; (d) focused on the topic of interest (AEs in LTC facilities, e.g., nursing home, residential facility, old age home); (e) involved residents (65 years and older), family relatives, direct care workers, facility managers; and (f) the care was provided for at least 1 month in the LTC facility. On the contrary, the study was not included if it: (a) involved social or administrative workers; (b) was carried out in home care settings; and (c) was a review study, discussion article, editorial, or commentary.

2.4. Study retrieval

Based on predefined criteria, the data were systematically retrieved by two independent researchers (DK, PF) within two retrieval phases. The search and retrieval process reflected the recommendations of PRISMA (Figure 1).²⁵ The program Rayyan QCRI®²⁶ (Rayyan Systems, Inc) was utilized to retrieve studies effectively in both retrieval phases. The search produced 1057 studies (220 from Scopus, 402 from ProQuest, and 435 from PubMed). After removing duplicates ($n = 112$), 945 studies were analyzed through titles and abstracts and examined against inclusion and exclusion criteria. In this phase, 917 studies were excluded because they did not directly relate to the stated research questions. In the second retrieval phase, 37 studies were examined by reading full-texts. The second phase resulted in 35 studies included in further analysis. Two studies were

excluded because they did not meet the inclusion criterion (the provision of care for at least 1 month).

2.5. Data extraction and analysis

Data extraction of studies included in the scoping review was performed by two independent researchers (DK, PF). Data were extracted using a spreadsheet in Microsoft Excel, which included the following information: author, year, country, design, sample (size and targeted respondents), data collection, data analysis, and facility type. Data were analyzed by the content analysis method, according to the specific methodology of Mayring.²⁷ The analysis resulted in the logical categorization of data. The main benefit of using this methodology is comprehensiveness. The methodological process consists of 8 specific steps. The results are presented narratively and in tables to address the defined research questions. The research team discussed data condensed and charted in tables and double-checked accuracy (10% of the material). Types of AEs and the contributing factors were identified from the studies in the results sections, tabulated, and then categorized. Expressions and language used by the study participants and study authors were used in the analysis to reduce interpretation.

3. Results

The systematized review included 35 studies that reflected the types of AE and the factors that contribute to them in LTC facilities (Table 2). Most of the studies analyzed were conducted in the United States ($n = 16$), followed by several European countries, such as Sweden ($n = 5$), Norway ($n = 2$), or the Netherlands ($n = 2$). Several studies were conducted in Canada ($n = 4$). Regarding the design of the study, most of the studies were quantitative in nature ($n = 29$). Most studies were carried out in nursing homes ($n = 22$) or in combination with other area ($n = 4$). In the remaining cases the LTC facilities were not specified ($n = 9$).

Search words	Hits
("Care, Long-Term" [Mesh] OR "Long Term Care" [Mesh] OR "Facilities, Residential" [Mesh] OR "Facility, Residential" [Mesh] OR "Residential Facility" [Mesh] OR "Nursing Home" [Mesh] OR "Homes, Nursing" [Mesh] OR "Old Age Homes" [Mesh] OR "Home, Old Age" [Mesh] OR "Homes, Old Age" [Mesh] OR "Old Age Home" [Mesh]) AND ("adverse event*")	PubMed: 435
("long-term care" OR "long term care" OR "nursing home*" OR "residential facility*" OR "old age home*") AND ("adverse event*")	Scopus: 220 ProQuest: 402
Total	1057

Table 1. The search process in scientific databases PubMed, Scopus, and ProQuest.

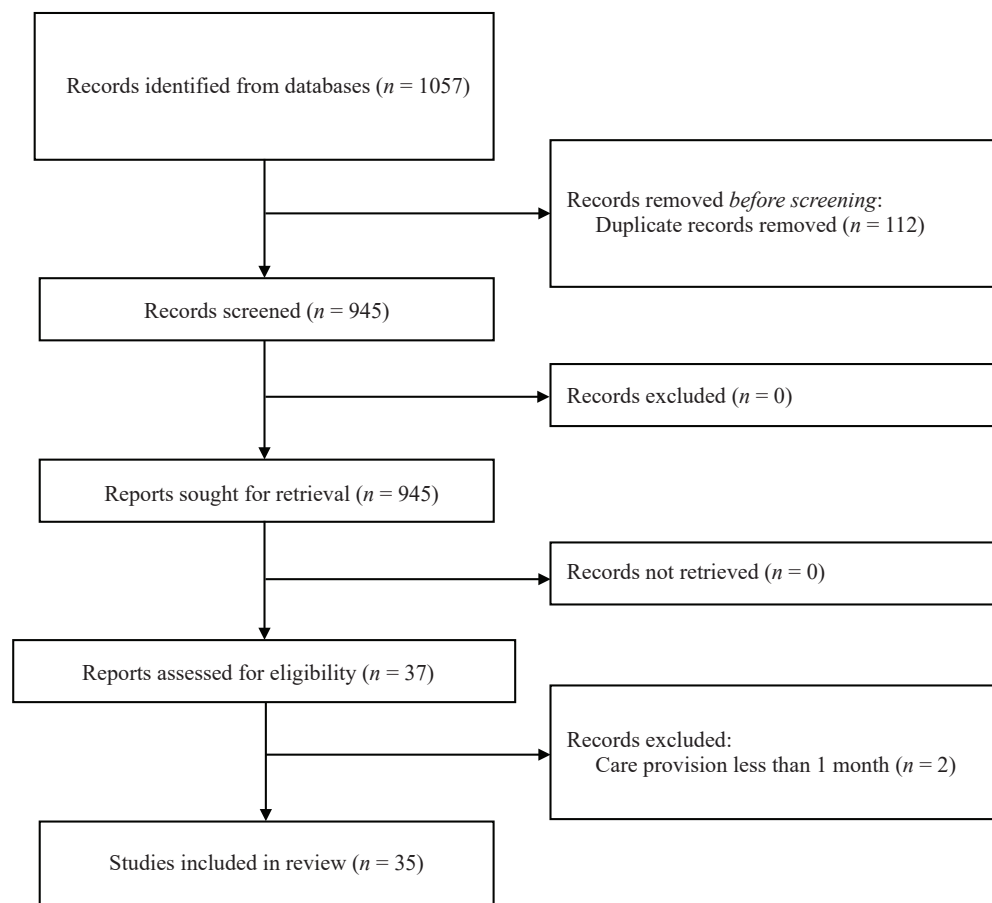


Figure 1. PRISMA flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Study, country	Study design	Sample	Data collection	Data analysis	Facility type
Abusalem et al. ²⁸ , USA	Quantitative, cross-sectional	N = 252 direct care workers	Questionnaire	Descriptive and inferential statistics	Non-specified
Andersson et al. ²⁹ , Sweden	Quantitative, retrospective	N = 173 reports	AEs reports	Content analysis, descriptive statistics	Nursing home
Aranda-Gallardo et al. ³⁰ , Spain	Quantitative, prospective	N = 647 residents	Questionnaire	Descriptive and inferential statistics	Nursing home
Boockvar et al. ³¹ , USA	Quantitative	N = 122 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home
Crespin et al. ³² , USA	Quantitative, cross-sectional	N = 15 037 reports	AEs reports	Descriptive and inferential statistics	Nursing home
Daneman et al. ³³ , Canada	Quantitative, cohort	N = 110 656 residents	AEs reports	Descriptive and inferential statistics	Nursing home
Dijkstra et al. ³⁴ , Netherland	Quantitative, cross-sectional	N = 13 633 residents	Questionnaire	Descriptive and inferential statistics	Nursing home
Doupe et al. ³⁵ , Canada	Quantitative, cohort	N = 22 846 residents	Administrative data	Descriptive and inferential statistics	Nursing home
Gerety et al. ³⁶ , USA	Quantitative, retrospective	N = 175 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home
Glette et al. ³⁷ , Norway	Qualitative, comparative	N = 17 nurses and nurse managers	Semi-structured interviews	Content analysis	Nursing home
Gurwitz et al. ³⁸ , USA	Quantitative, retrospective	N = 490 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home

Continued

Table 2. Continued

Study, country	Study design	Sample	Data collection	Data analysis	Facility type
Halligan et al. ³⁹ , Canada	Mixed method	N = 26 direct care workers	Questionnaire, semi-structured interviews	Descriptive statistics; content analysis	Non-specified
Herrmann et al. ⁴⁰ , Canada	Quantitative	N = 24 residents	Questionnaire	Descriptive and inferential statistics	Non-specified
Hughes et al. ⁴¹ , USA	Quantitative, retrospective	N = 8267 residents	Questionnaire	Descriptive and inferential statistics	Nursing home
Kapoor et al. ⁴² , USA	Quantitative, prospective	N = 555 residents	Residents' documentation	Descriptive and inferential statistics	Non-specified
Kapoor et al. ⁴³ , USA	Quantitative, prospective	N = 555 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home
Lannering et al. ⁴⁴ , Sweden	Quantitative, longitudinal	N = 429 residents	Questionnaire	Descriptive and inferential statistics	Nursing home
Lexow et al. ⁴⁵ , Germany	Quantitative, cross-sectional	N = 104 residents	Interviews, residents' documentation, medication analysis	Descriptive and inferential statistics	Non-specified
Lindblad et al. ⁴⁶ , Sweden	Quantitative, retrospective	N = 518 records	Residents' documentation	Descriptive and inferential statistics	Nursing home
Lindblad et al. ⁴⁷ , Sweden	Quantitative, retrospective	N = 600 records	Residents' documentation	Descriptive and inferential statistics	Nursing home
Lombardo et al. ⁴⁸ , Italy	Quantitative	N = 1356 residents	Questionnaire	Descriptive and inferential statistics	Nursing home
McDonald et al. ⁴⁹ , USA	Quantitative	N = 50 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home
Niznik et al. ⁵⁰ , USA	Quantitative, retrospective	N = 37,106 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home
Oliveria et al. ⁵¹ , USA	Quantitative, retrospective	N = 7728 residents	Questionnaire	Descriptive and inferential statistics	Nursing home
Prang and Jelsness-Jørgensen ⁵² , Norway	Qualitative	N = 13 nurses	Semi-structured interviews	Thematic analysis	Nursing home
Quach et al. ⁵³ , USA	Quantitative, cross-sectional	N = 56 nurses	Questionnaire	Descriptive and inferential statistics	Nursing home, community center
Resnik and Galik ⁵⁴ , USA	Secondary analysis	N = 199 residents	Questionnaire	Descriptive and inferential statistics	Nursing home, residential care
Shmueli et al. ⁵⁵ , Israel	Quantitative, descriptive	N = 1364 reports	AEs reports	Descriptive and inferential statistics	Non-specified
Trinks et al. ⁵⁶ , Sweden	Quantitative, retrospective	N = 40,224 residents	AEs reports	Descriptive and inferential statistics	Nursing home, hospital
Van Gaal et al. ⁵⁷ , Netherlands	Quantitative, prospective	N = 687 patients N = 241 residents	Residents' documentation	Descriptive and inferential statistics	Nursing home, hospital
Wagner et al. ⁵⁸ , USA	Quantitative, cross-sectional	N = 289 nurses	Questionnaire	Descriptive and inferential statistics; content analysis	Non-specified
Wagner et al. ⁵⁹ , USA	Quantitative	N = 399 managers of nursing homes	Questionnaire	Descriptive and inferential statistics	Nursing home
Wagner et al. ⁶⁰ , USA	Quantitative	N = 32 states; healthcare departments	Questionnaire	Descriptive and inferential statistics	Nursing home
Wang et al. ⁶¹ , Australia	Quantitative, case-control	N = 332 cases N = 332 controlled cases	Residents' documentation	Descriptive and inferential statistics	Non-specified
Yu and Perng ⁶² , Taiwan, China	Quantitative, cross-sectional	N = 213 nurse aids	Questionnaire	Descriptive and inferential statistics	Non-specified

Note: AEs, adverse events.

Table 2. Characteristics of the included studies.

3.1. Resources and methods of collecting data in the analyzed studies

The resources used most frequently to investigate AEs were reports from various types of reporting systems. Other methods included specific instruments evaluating AEs, but also resident records, interviews, or population-based administrative databases. All methods are reported in Table 3.

The prevalence of AEs was examined in studies during different periods. Most commonly, they focused on the short evaluation period, ranging from 3 months to 12 months.^{29,38,49,56} Likewise, some studies focused on evaluating AEs in the past few years, ranging from 2 years^{30,51} to a maximum of 5 years.³⁵

3.2. Types of AEs in LTC facilities

Based on the content analysis, 133 different types of AE were identified in LTC facilities. AEs were categorized

into those related to physiological functioning (Table 4) and those related to psychological functioning (Table 5).

3.2.1. AEs impacting physiological functioning

Concerning the category of AEs that affect physiological functioning, 107 different types of AEs were identified in the LTC facilities. The most prominent and, at the same time, the most frequently reported AEs were falls,^{35,56,62} primarily falls with injury.^{43,50,53} Falls comprised 63.9% of all AEs in the study by Shmueli et al.⁵⁵ from which the most frequently reported were falls while walking (42.3%) and falls from the bed (27.0%). Kapoor et al.⁴² reported that 52.0% of AEs were represented by falls with injury and occurred during care provision. In addition, 87.8% of the AEs reported were preventable. The second most common AE in LTC facilities were pressure ulcers.^{28,45,57} In most studies, pressure ulcers were considered as preventable AEs.⁴² However, in these studies, only little information was reported

Resources and methods	Examples of references
<i>Reporting systems</i>	
Centers for Medicare and Medicaid Services	Abusalem et al. ²⁸ ; McDonald et al. ⁴⁹ ; Niznik et al. ⁵⁰
Health and Social Care Inspectorate	Andersson et al. ²⁹
Medication Error Quality Initiative – Individual Error System	Daneman et al. ³³
Veterans' Health Administration Office of Reporting, Analytics, Performance, Improvement & Deployment	Quach et al. ⁵³
Computerized AE Management System	Shmueli et al. ⁵⁵
the Taiwan Patient Safety Reporting System	Yu and Perng ⁶²
Minimum Data Set	Hughes et al. ⁴¹ ; Oliveria et al. ⁵¹
<i>Instruments</i>	
The Dutch National Prevalence Survey of Care Problems	Dijkstra et al. ³⁴
The Modified Stanford Patient Safety Culture Survey Instrument	Halligan et al. ³⁹
Risk assessment tools	Lindblad et al. ⁴⁶ ; Van Gaal et al. ⁵⁷
Trigger tool	Lindblad et al. ⁴⁶ ; Lindblad et al. ⁴⁷
National Survey on AEs	Lombardo et al. ⁴⁸
Senior Alert, ⁵⁶	Trinks et al. ⁵⁶
The Communicating about Nursing Error Survey	Wagner et al. ⁵⁸
The Survey on AEs, ⁵⁹	Wagner et al. ⁵⁹
The State Incident Reporting Policies and Practices, ⁶⁰	Wagner et al. ⁶⁰
<i>Other methods</i>	
Residents' records	Boockvar et al. ³¹ ; Gerety et al. ³⁶ ; Gurwitz et al. ³⁸ ; Kapoor et al. ⁴² ; Kapoor et al. ⁴³ ; Wang et al. ⁶¹
Residents' records in combination with risk assessment tools	Herrmann et al. ⁴⁰
Interviews	Glette et al. ³⁷ ; Lexow et al. ⁴⁵ ; Prang and Jelsness-Jørgensen ⁵²
Verification of the record by caregiver and residents themselves	Aranda-Gallardo et al. ³⁰
Population-based administrative databases	Daneman et al. ³³ ; Doupe et al. ³⁵
Cumulative count of AEs	Resnick and Galik ⁵⁴

Note: AEs, adverse events.

Table 3. Resources and methods of collecting the data in analyzed studies.

AEs impacting physical functioning	Examples of references
Falls <i>Falls with injury; Falls while walking; Falls from bed; Witnessed falls; Resident found on the floor</i>	Abusaleem et al.²⁸; Andersson et al.²⁹; Aranda-Gallardo et al.³⁰; Doupe et al.³⁵; Herrmann et al.⁴⁰; Kapoor et al.⁴²; Kapoor et al.⁴³; Lannering et al.⁴⁴; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Lindblad et al.⁴⁷; Lombardo et al.⁴⁸; Prang and Jelsness-Jørgensen⁵²; Quach et al.⁵³; Resnick and Galik⁵⁴; Shmueli et al.⁵⁵; Trinks et al.⁵⁶; Van Gaal et al.⁵⁷; Wagner et al.⁵⁸; Wagner et al.⁶⁰; Yu and Perng⁶²
Pressure ulcers <i>Not specified</i>	Abusaleem et al.²⁸; Dijkstra et al.³⁴; Doupe et al.³⁵; Kapoor et al.⁴²; Kapoor et al.⁴³; Lannering et al.⁴⁴; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Lombardo et al.⁴⁸; Quach et al.⁵³; Trinks et al.⁵⁶; Van Gaal et al.⁵⁷; Wagner et al.⁶⁰; Yu and Perng⁶²
Medication errors <i>Adverse reactions of medications (Medication interactions; Affected laboratory values); Wrong dosage (Overdose or underdose); Medication administered to wrong resident (Incorrect identification of resident); Wrong medication administered to the resident; Insufficient follow-up after medication administration;</i> <i>Wrong rate of administration; Improper storage of medications; Prescription – missing or unclear; Wrong route of medication administration; Wrong technique of medication administration; Wrong time of medication administration; Administration of expired medication</i>	Andersson et al.²⁹; Boockvar et al.³¹; Crespin et al.³²; Gerety et al.³⁶; Gurwitz et al.³⁸; Kapoor et al.⁴²; Lindblad et al.⁴⁶; Lindblad et al.⁴⁷; Prang and Jelsness-Jørgensen⁵²; Shmueli et al.⁵⁵; Wagner et al.⁵⁸; Wagner et al.⁶⁰; Yu and Perng⁶²
Infections <i>Urinary tract infection (Prolonged catheter use; Hematuria); Respiratory infections; Multiresistant infections; Conjunctivitis; Surgical/procedural site infection; Skin infection; Vulval infection; Gastroenteritis; Clostridium difficile infection; Infection disease outbreak among residents</i>	Abusaleem et al.²⁸; Boockvar et al.³¹; Daneman et al.³³; Doupe et al.³⁵; Gurwitz et al.³⁸; Kapoor et al.⁴²; Lexow et al.⁴⁵; Lombardo et al.⁴⁸; Oliveria et al.⁵¹; Quach et al.⁵³; Van Gaal et al.⁵⁷; Wagner et al.⁶⁰
Gastrointestinal problems <i>Vomiting; Nausea; Abdominal pain; Diarrhea; Obstipation; Dehydration; Impaired mouth health; Gastrointestinal bleeding (Blackened stool); Bowel obstruction; Cholelithiasis; Cholecystitis; Malnutrition (Decreased appetite; Weight changes; Abnormal glucose value)</i>	Boockvar et al.³¹; Daneman et al.³³; Gerety et al.³⁶; Gurwitz et al.³⁸; Hughes et al.⁴¹; Herrmann et al.⁴⁰; Kapoor et al.⁴²; Lannering et al.⁴⁴; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Lindblad et al.⁴⁷; Lombardo et al.⁴⁸; Oliveria et al.⁵¹; Trinks et al.⁵⁶
Cardiovascular problems <i>Chest pain – cardiac; Palpitations; Hypertension; Exacerbation of health failure; Systemic embolism; Deep vein thrombosis; Pulmonary embolism; Cardiac arrest; Cardiogenic shock; Orthostatic hypotension; Supraventricular tachyarrhythmia; Peripheral oedema</i>	Boockvar et al.³¹; Gerety et al.³⁶; Gurwitz et al.³⁸; Kapoor et al.⁴²; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Oliveria et al.⁵¹
Neurological problems <i>Quantitative disorders of consciousness (Somnolence); Tremor; Sense-organ disorders (eye, ear); Seizure; Stroke; Fatigue; Insomnia</i>	Boockvar et al.³¹; Gerety et al.³⁶; Gurwitz et al.³⁸; Herrmann et al.⁴⁰; Hughes et al.⁴¹; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Oliveria et al.⁵¹
Skin problems <i>Bruises; Angioedema; Burns; Alopecia; Hyperhidrosis; Pruritus</i>	Herrmann et al.⁴⁰; Kapoor et al.⁴²; Kapoor et al.⁴³; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Oliveria et al.⁵¹; Wagner et al.⁶⁰; Yu and Perng⁶²
Musculoskeletal problems <i>General muscle weakness; Impaired walking; Arthritis; Fractures (Hip fractures)</i>	Boockvar et al.³¹; Doupe et al.³⁵; Gerety et al.³⁶; Lexow et al.⁴⁵; Niznik et al.⁵⁰; Oliveria et al.⁵¹
Hemorrhagic complications <i>Epistaxis; Hematoma; Purpura</i>	Gurwitz et al.³⁸; Kapoor et al.⁴²; Lexow et al.⁴⁵; Oliveria et al.⁵¹
Respiratory problems <i>Respiratory failure</i>	Kapoor et al.⁴²; Lexow et al.⁴⁵
Non-categorized: <i>Deterioration in vital signs; Urine incontinence; Distended urinary bladder; Suffocation; Allergic reaction (Urticaria); Deviation from a normal course after invasive procedure/surgical treatment; Accidental injury; Death</i>	Daneman et al.³³; Gerety et al.³⁶; Gurwitz et al.³⁸; Kapoor et al.⁴²; Lexow et al.⁴⁵; Lindblad et al.⁴⁶; Lindblad et al.⁴⁷; Lombardo et al.⁴⁸; Niznik et al.⁵⁰; Oliveria et al.⁵¹; Yu and Perng⁶²

Note: AEs, adverse events; LTC, long-term care.

Table 4. AEs impacting physical functioning in LTC facilities.

on specifications related to the stages or locations of pressure ulcers in residents. For example, Kapoor et al.⁴³ considered pressure ulcers at any stage, while authors in the study by Van Gaal et al.⁵⁷ considered pressure ulcer as present if a patient developed a pressure ulcer Category 2 or worse, according to the

European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel (EPUAP/NPUAP) classification system. Other important AEs were medication errors,^{29,46,58} mainly in terms of adverse drug reactions,⁴⁸ administration of incorrect doses,³² or insufficient monitoring of residents after application of the medication.³⁸

AEs impacting psychological functioning	Examples of references
Agitation	Gerety et al. ³⁶ ; Herrmann et al. ⁴⁰ ; Kapoor et al. ⁴² ; Lexow et al. ⁴⁵ ; Lindblad et al. ⁴⁷ ; Lombardo et al. ⁴⁸ ; Oliveria et al. ⁵¹
Pain <i>Back pain; Headache; Pain in extremity</i>	Boockvar et al. ³¹ ; Lexow et al. ⁴⁵ ; Lindblad et al. ⁴⁶ ; Lindblad et al. ⁴⁷ ; Oliveria et al. ⁵¹
Change in mental status	Lindblad et al. ⁴⁶ ; Lindblad et al. ⁴⁷ ; Lombardo et al. ⁴⁸ ; Lexow et al. ⁴⁵
Hospitalization <i>Unplanned visit of emergency</i>	Glette et al. ³⁷ ; Gerety et al. ³⁶ ; Lindblad et al. ⁴⁶ ; McDonald et al. ⁴⁹ ; Niznik et al. ⁵⁰ ; Oliveria et al. ⁵¹ ; Resnick and Galik ⁵⁴
Alteration in behaviour	Lindblad et al. ⁴⁶ ; Lexow et al. ⁴⁵ ; Lombardo et al. ⁴⁸
Errors in communication about residents	Lindblad et al. ⁴⁶ ; Lindblad et al. ⁴⁷ ; Wagner et al. ⁵⁸
Delirium	Kapoor et al. ⁴² ; Lombardo et al. ⁴⁸ ; Oliveria et al. ⁵¹
Anxiety	Lexow et al. ⁴⁵ ; Lindblad et al. ⁴⁶ ; Oliveria et al. ⁵¹
Suicidal behaviour	Andersson et al. ²⁹ ; Wagner et al. ⁶⁰
Violence <i>Resident-to-resident; Resident-to-staff; Staff-to-resident</i>	Shmueli et al. ⁵⁵ ; Wagner et al. ⁶⁰
Hallucinations	Gerety et al. ³⁶ ; Lexow et al. ⁴⁵
Lethargy	Boockvar et al. ³¹ ; Lexow et al. ⁴⁵
Self-injury	Shmueli et al. ⁵⁵
Abuse (physical, sexual)	Wagner et al. ⁶⁰
Personality change	Lexow et al. ⁴⁵
Delays in diagnosis or treatment	Kapoor et al. ⁴²
Escape of resident	Yu and Perng ⁶²
Depression	Lexow et al. ⁴⁵
Suicide	Wagner et al. ⁶⁰

Note: AEs, adverse events; LTC, long-term care.

Table 5. AEs impacting psychological functioning in LTC facilities.

In the study by Andersson et al.,²⁹ medication errors involved 37.0% of all AEs. Crespín et al.³² found that administration of incorrect doses represented 56.5% of all medication errors and was the most prevalent type of these errors. In addition, most medication errors occur during the course of medication administration (49.1%) or in the prescribed treatment documentation (38.8%). According to the results of Gurwitz et al.³⁸, medication errors occur more frequently during the daily shift, between 7 AM and 3 PM. The least frequently reported AEs in LTC facilities were hemorrhagic complications^{38,42} and respiratory problems.^{42,45}

3.2.2. AEs impacting psychological functioning

Within the category of AEs related to psychological functioning, 26 different types of AEs were identified in the LTC facilities. The most dominant and frequently reported AE was resident's agitation^{47,51} and pain,^{31,45} including back pain and pain in the extremity.⁴⁵ In the Oliveria et al. study,⁵¹ agitation occurred in 27.6% of the residents and was one of the most prevalent AEs in

residents with Alzheimer's disease and psychosis. In the Gerety et al. study,³⁶ agitation was classified in 17% of residents as an adverse drug event. Alarming, violence and abuse of residents were reported as AEs in several LTC facilities.^{55,60} According to Shmueli et al.,⁵⁵ violence (staff to patient, patient-to-patient, patient-to-staff, family-to-patient or staff) was the second most reported AE. The unplanned hospitalization,^{37,50} respectively, urgent emergency visits due to an unexpected complication in the resident's health status were other AEs⁵⁴ impacting the psychological functioning of the residents, primarily in terms of their decreased satisfaction. In contrast, personality change,⁴⁵ escape of resident,⁶² self-injury,⁵⁵ or depression (as an adverse drug event)⁴⁵ were the least frequently reported AEs in the LTC facilities.

3.3. Factors contributing to AEs

Based on the content analysis, 60 factors that contribute to AEs in LTC facilities were identified. These factors were categorized into two meaningful groups: organization-related and resident-related factors.

3.3.1. Organization-related factors that contribute to AEs

Within organization-related factors, 45 factors were determined in the analyzed studies. The most significant factor was the inadequate number of healthcare professionals,^{48,58} especially nurses^{28,39} and physicians.³⁷ The shortage of healthcare professionals represents the global problem that significantly affects patient care quality and safety, primarily in the context of the occurrence of AEs.⁴⁷ Another important identified factor was the lack of a patient safety culture in LTC facilities,^{28,53} especially in terms of punitive responses,³⁹ ineffective leadership, and inadequate support from the manager responsible for safety.^{39,53} Moreover, the work environment considered as unsafe contributed similarly to AEs in LTC facilities.^{32,53} On the contrary, if the patient's safety culture was considered positive and adequate, the LTC facilities reported fewer AEs, such as falls, pressure ulcers, and urinary tract infections.²⁸ Other contributing factors were insufficient competence of healthcare professionals,^{37,47} higher licensed practical nurse hours per resident day compared with registered nurses hours,^{28,55} the insufficient time needed for the provision of necessary nursing care activities^{37,58} and inadequate work conditions^{32,58} including ineffective work organization,⁴⁷ insufficient resources necessary for the provision of fundamental or specific nursing care,^{32,47} and ineffective teamwork.^{29,39} Furthermore, the workload of nurses was identified as another significant factor that may lead to AEs.^{32,37,39,58} Similarly, there was evidence that healthcare professionals in LTC facilities face several challenging situations that contribute significantly to AEs. One of them is the premature transfer of residents without completing treatment from the hospital to LTC.³⁷ Furthermore, a high number of residents per nurse in LTC^{58,62} has been determined as the factor that contributes to the higher incidence of urinary tract infections.²⁸ Furthermore, a higher incidence of AE was shown to be related to insufficient financial resources^{37,39} as well as the type and size of the LTC facility.⁴⁸ More AEs have been reported in nursing homes and facilities with a bed capacity of over 60 beds.^{48,62} Interestingly, a higher number of AEs were also reported during night shifts.³⁰ Frequently reported contributory factors were inadequate knowledge or skills related to care provision or insufficient experience of care workers,^{47,62} but also the prevalence of missed nursing care,^{29,47} which relates to the non-adherence to processual standards of care^{47,58} and suboptimal provision in assessing and monitoring of residents' health status^{29,47,49} and teaching or prevention.^{29,49} Factors such as unwillingness to accept best practices or to change care workers' behavior and performance,³⁹ decreased job satisfaction,³⁷ and

emotional exhaustion^{32,37,39} also lead to AEs in LTC facilities. Another contributing factor raising ethical issues is the unnecessary use of physical restrictions in the care of residents.^{30,48}

3.3.2. Resident-related factors contributing to AEs

Within the category of resident-related factors, 16 factors were identified. The most frequently described factor was the use of medications, which often resulted in residents' falls.^{31,45} Similarly, the risk of AEs was potentiated by polypharmacy^{36,44} but also increased use of antibiotics or psychotropic drugs.^{33,48} Another significant factor was the age of the residents. In the group of residents <75 years old, more AEs were reported compared with younger residents.^{30,33} A meaningful group of factors that contribute to AEs related to the health status of residents. The highest number of AEs was reported in residents with decreased ability of self-care,^{33,43} decreased or impaired mobility,^{34,35,44} cognitive deficits,^{32,44} chronic diseases,^{33,35} and polymorbidity.^{36,37} Falls were the most commonly reported in residents with decreased mobility, where pressure ulcers were reported as the result of several affecting factors, such as a higher age of residents, decreased mobility, and polypharmacy.⁴⁴ Interestingly, more AEs were reported in male residents.³⁰

4. Discussion

Our systematized review aimed to collect empirical evidence focusing on the types of AE and factors that contribute to them in LTC facilities. Existing evidence on AEs highlighted the need for further research on the topic,³ while earlier studies on AEs were limited to specific setting¹⁷ or focused on the specific AE²² or intervention.²¹ Our review takes a broader approach to AEs in LTC facilities to capture generic but recurring safety issues. We identified 131 types of AEs and 60 factors that contribute to them in LTC facilities.

With the increasing trend of an aging population, the number of LTC facilities also increases. However, the quality of care in these facilities is often reported as poor.⁶³ Poor quality of care can be attributed to multiple AEs that negatively affect residents' safety.⁶⁴ Furthermore, the number of AEs in LTC facilities is significantly higher compared with acute care facilities.³ For example, in the USA, estimates of the harm rate were determined for 46% in LTC, while the prevalence of AEs in acute care facilities was identified to be 27%. Alarmingly, up to 21% of residents experience AEs in LTC facilities every year.⁶⁵ AEs in LTC facilities represent a significant problem, but data related to AEs on a national level from Europe, Asia, Africa, or other continents are

only sporadically reported. Therefore, identifying AEs and exploring contributing factors is crucial to improve quality of care and residents' safety.²

The main group of factors was related to organization (system factors) in our review, which is in line with the study of Andersson et al.² who identified 18 factors that contribute to AEs and most of which were related to system factors. Furthermore, system factors have the potential to trigger active errors or errors, leading to serious AEs, often resulting in a resident's disability or unexpected death. In line with international studies,^{2,66} inadequate healthcare professionals, lack of time, and inadequate working conditions were the most dominant factors in this category. The inadequate number of healthcare professionals is a global problem that directly jeopardizes patient safety and quality of care and is also evidenced in LTC facilities.¹⁶ In addition, emphasis should be placed on ensuring a careful balance between licensed practical nurses and registered nurses. This seems to play a significant role in ensuring the quality of care in LTC facilities.⁶³ An effective skill mix should be established to achieve the best outcomes, but an effective delegation among direct care workers should also be adjusted.⁶⁷ Furthermore, the inadequate number of healthcare professionals is related to the insufficient time to provide the necessary nursing care activities. Our findings are consistent with the study of Kalánková et al.,⁴ who identified that time scarcity has a direct and negative impact on AEs related to the care of residents. We identified that inadequate work conditions relate to the work organization, ineffective teamwork, and inadequate communication within the team, and directly lead to the risk of AEAEs. Likewise, an unsafe work environment with a missing patient safety culture demonstrably threatens the safety of residents.^{68,69} Clear and effective communication, particularly when sharing resident information within a team and empowered teamwork, is needed to reduce the risks of AEs in LTC facilities.⁶⁵

Furthermore, we acknowledged inadequate knowledge, skills, or experiences of care workers⁴⁷ together with missed nursing care²⁹ as other meaningful factors. Inadequate knowledge, skills, or experiences are reflected particularly in situations where no necessary action was taken when the resident's condition deteriorated.² This is a common situation where registered nurses do not work on shifts. The possible explanation for these findings could be related to the inadequate skill mix of healthcare professionals, but also to insufficient competence to ensure safe care. According to Bing-Jonsson et al.,⁷⁰ direct care workers in Norwegian nursing homes had insufficient competence to provide the necessary nursing care activities, leading to a higher

incidence of AEs. Direct care workers had no competence in assessment, monitoring of residents, and documentation. Additionally, the reluctance of healthcare professionals to obtain up-to-date knowledge, accept best practices, or change the behavior and performance of healthcare workers could explain the appearance of AEs in LTC facilities.^{11,68,71} Furthermore, failure to act when necessary is associated with missed nursing care and, similarly, with various types and severity of AEs in LTC facilities.⁴ Recently, missed nursing care in community health settings has been reviewed in the study of Andersson et al.,⁷² who attributed missed nursing care to AEs. Other factors contributing to AEs, reported by Andersson et al.² and Wang et al.⁶⁹ involve non-adherence to care standards and errors in resident documentation, which correspond to the findings of our systematized review. Given the needs of the residents for comprehensive care, it is reasonable to assume that their safety depends on direct care workers. Furthermore, correct record keeping in documentation is also necessary for sharing information between residents, their relatives, and caregivers, including licensed practical nurses, registered nurses, and other healthcare professionals² without misunderstandings. This highlights the importance of documentation in terms of communicating safe nursing care.

In addition, we identified resident-related factors that affect the occurrence of AEs. These factors reflect mainly the characteristics of the residents, such as age, gender, or health condition, rather than their behavior or attitudes toward care workers or direct caregivers. In our systematized review, medication use, age, and health status were the most significant factors related to residents. We identified that polypharmacy is the most important contributing factor to AEs,⁴⁴ also supported by the study of Cloete.⁷³ In LTC facilities, regular medication review and careful consideration of prescription and administration of additional medication should become an effective strategy to reduce AEs associated with medication use.³¹ The age of the resident is an important factor contributing to AEs, more specifically if the resident is <75 years old. Several authors^{13,14} supported our findings and declared that age-related AEs in LTC facilities are associated mainly with the manifestation of ageism, such as infantilism, insulting, arguing, or manipulative behavior or actions toward residents. We also found that residents experiencing physical or psychological deterioration, such as impaired mobility or cognitive deficit, were at a greater risk of AEs than self-sufficient residents or those with no cognitive deficit.^{35,44} Similarly to our findings, Palese et al.⁷⁴ stated that the most jeopardized group of residents in terms of AEs are those with a cognitive deficit, specifically the severe

form of dementia. Based on our findings, we can conclude that most of the characteristics of residents that contribute to AEs are somehow associated with the phenomena of ageism. The consequences of ageism are compelling for the elderly, especially in terms of AEs. The principles of care provision in LTC facilities should meet residents' fundamental rights to respectful and dignified care. If care provision does not comply with the fundamental rights and values, serious ethical issues arise, especially in the case of harm to residents.⁴

4.1. Limitations

The systematized review has several limitations. The first limitation is the inclusion of studies published exclusively in English. Additionally, the number of scientific databases used in the literature search depended on institutional accessibility, therefore some relevant studies could be omitted. In contrast, the selected review design enabled the collation of an extensive number of empirical studies and, at the same time, deepening our understanding of the literature.

5. Conclusions

AEs and factors contributing to them in LTC facilities represent the problem with insufficient attention paid in international or national contexts. Several research studies conducted in the European context are minimal. The healthcare professional communities must be aware that elderly patients and residents are most vulnerable compared with other group of patients due to their vulnerability due to higher age, polypharmacy, and physical or mental deterioration. Considering the trend of the aging population, nursing research should focus on identifying factors that contribute to AEs in LTC facilities followed by consequent planning and implementation of strategies aimed at reducing AEs. The main gaps in the determination of factors that condition AEs that

are commonly modifiable could contribute to considerable problems in the prediction and effective settings of preventive measures. Managers of LTC facilities should consider implementing systematic measures, since most AEs are preventable. Measuring the rates of AEs in LTC facilities should be considered a priority health policy issue. The systematized review has raised implications for nursing care that calls for further research, mainly for precise identification, close monitoring, reporting, and documenting AEs in LTC facilities. More quantitative, qualitative, and mixed-method research studies should focus on various targeted groups, including residents and their relatives, as AEs affect them the most, but research in the future should also involve managers, caregivers, and policymakers to obtain comprehensive evidence on AEs in LTC facilities. Another review could also focus on the frequency comparison of these events as well, as it should cover other areas of care provided. The main challenge is to develop such reporting systems that eliminate the fear of reporting AEs and promote a non-blaming culture and just culture in LTC facilities.

Author contribution

All listed authors confirm that they participated in the development of the manuscript in the following ways: conception and design or analysis and interpretation of the data; drafting the article or revising it critically for important intellectual content, and final approval of the version to be published.

Ethical approval

Ethical issues are not involved in this paper.

Conflicts of interest

All contributing authors declare no conflicts of interest.

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