



Sick Day Medication Guidance for People With Diabetes, Kidney Disease, or Cardiovascular Disease: A Systematic Scoping Review

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Rationale & Objective: Sick day medication guidance has been promoted to prevent adverse events for people with chronic conditions. Our aim was to summarize the existing sick day medication guidance and the evidence base for the effectiveness of interventions for implementing this guidance.

Study Design: Scoping review of quantitative and qualitative studies.

Setting & Population: Sick day medication guidance for people with chronic conditions including diabetes mellitus, kidney diseases, and cardiovascular diseases.

Selection Criteria for Studies: A search of 6 bibliographic databases (Ovid MEDLINE, Ovid Embase, CINAHL, Scopus, Web of Science Core Collection, and Cochrane Library [via Wiley]) and a comprehensive gray literature search were completed in June 2021.

Data Extraction: Intervention and study characteristics were extracted using standardized tools.

Analytical Approach: Data were summarized descriptively, and our approach observed the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping reviews.

Results: The literature search identified 2,308 documents, which were screened against the eligibility criteria, leading to 74 documents that were included. The majority of the identified documents (n = 55) were guidelines or educational resources. Of the 19 primary research studies identified, 10 studies described an intervention, with only 2 examining the effect of sick day medication guidance interventions within clinical care and no studies reporting beneficial effects on clinical outcomes. Most documents (n = 58) included guidance specific to patients with diabetes mellitus, with fewer including guidance for patients with chronic kidney disease (n = 9) or heart failure (n = 2).

Limitations: Risk of bias was not assessed.

Conclusions: Many resources promoting sick day medication guidance have been developed; however, there is very little empirical evidence for the effectiveness of current approaches in implementing sick day medication guidance into practice. Recommendations for the use of sick day medication guidance will require further research to develop consistent, understandable, and usable approaches for its implementation within self-management strategies as well as empirical studies to demonstrate the effectiveness of these interventions.

Complete author and article information provided before references.

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Approximately 50% of adults in the United States and 44% of adults in Canada have at least 1 chronic medical condition.^{1,2} Most people with chronic condi-

Editorial, XXX

tions, including kidney and cardiovascular diseases, require multiple medications. Although medications are crucial to improving long-term outcomes, they can contribute to serious complications in the face of common acute illnesses,³⁻⁶ including those causing volume depletion, hypotension, acute kidney injury, diabetic ketoacidosis, or hypoglycemia. Sick day medication guidance typically includes recommendations to withhold specific medications for the duration of the symptoms that lead to reduced oral intake.^{4,7}

Sick day medication guidance has been promoted by several health organizations from various countries, including the American Diabetes Association, Think

Kidneys UK, Diabetes Canada, and the UK National Institute for Health and Care Excellence.⁸⁻¹¹ Many of these groups have included sick day medication guidance within guidelines and developed educational materials for patients and health care providers about how to self-manage medications during sick days, including lists of medications to temporarily stop or adjust during acute illness. Although there are many published recommendations and resources for sick day medication guidance intended to prevent medication-related complications, the recommendations included in these resources and types of evidence available have not been comprehensively synthesized.

We undertook this scoping review to systematically characterize the depth and breadth of the literature available regarding sick day medication guidance for people with diabetes, kidney disease, or cardiovascular disease. Our aim was to summarize and synthesize existing recommendations (including the medications, education,

PLAIN-LANGUAGE SUMMARY

Sick day medication guidance is intended to prevent adverse events during acute illness for people with chronic conditions. This scoping review was conducted to summarize the existing sick day medication guidance and the evidence base for the effectiveness of interventions that have attempted to implement this guidance. Most of the documents identified by the review were educational resources or guidelines, and there were relatively few primary research studies. There was very little research on the effectiveness of interventions and their impact on patient outcomes. This scoping review identifies important knowledge gaps in sick day medication guidance and suggests a need for additional research to understand the usability and effectiveness of medication safety interventions for people with diabetes mellitus, kidney disease, or cardiovascular disease.

self-management strategies, and interventions) and examine the evidence base for sick day medication guidance for people with chronic conditions.

METHODS

We followed the methodology for conducting scoping reviews outlined by Arksey and O'Malley¹² and further developed by Levac et al.¹³ Additionally, we followed the reporting recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-analyses Statement for Scoping Reviews¹⁴ and the updated methodological guidance produced by Peters et al.¹⁵ Two patient partners (SR, NV) helped define the review question and identify sources of information for the review that would be relevant to patients. They also provided their interpretation of findings and helped critically revise the manuscript from the patient perspective.

Search Strategy

With the assistance of a medical librarian (JYK), we conducted comprehensive searches of Ovid MEDLINE, Ovid Embase, CINAHL, Scopus, Web of Science Core Collection, and Cochrane Library (via Wiley) on June 15, 2021. We designed the search terms to capture all relevant literature pertaining to medication management in patients with chronic conditions who become acutely ill. A diverse set of keywords and controlled vocabulary were used where applicable. No language or date limits were applied. The detailed search strategies are provided in [Item S1](#).

In addition, we performed a gray literature search, which included 3 components ([Item S1](#)). First, we performed a Google Scholar search, with the first 200 results identified for review, because a high overlap between Web of Science and Google Scholar has been demonstrated in

previous work.¹⁶ Second, we conducted a targeted search of medical organization websites, including the American Diabetes Association, Diabetes Canada, Think Kidneys UK, and others, using the term “sick day.” Third, we performed general and targeted Google searches using the terms “sick day protocol” or “sick day guidance” or “sick day rule.” The targeted Google search involved searching specific sites (eg, site:ca; site:gov) in addition to the keywords. The first 5 pages of the general and targeted Google search results were reviewed, and documents were screened for eligibility.

Eligibility Criteria

We included documents if they addressed sick day medication guidance for patients with 1 or more chronic condition(s) of interest (diabetes mellitus, kidney disease, or cardiovascular disease). We included peer-reviewed literature (including primary research articles addressing education, implementation strategies, and/or effectiveness), published guidelines, and position statements identified from any source. For the gray literature search, we did not restrict document inclusion to peer-reviewed articles so as to include organizational sick day medication guidance documents and resources that were publicly available as material produced for patients or health care providers (eg, patient handouts/webpages, guidelines, or position statements). Documents that did not relate to one of the chronic conditions of interest, did not describe sick day medication guidance, were related to occupational sick leave, or were written in a language other than English were excluded. Commentaries and narrative reviews were also excluded.

Data Collection, Extraction, and Analysis

We screened all titles and abstracts were screened once by 2 team members. The full text of any article selected by 1 or more reviewer during title and abstract screening was obtained and reviewed independently in full by 2 reviewers to determine eligibility. Documents that were deemed eligible after full text review by only 1 of the 2 reviewers were reviewed in full by a third team member, and discrepancies were resolved through discussion between the 3 reviewers. The article selection process was managed using Covidence (www.covidence.org).

We performed data extraction using a predefined template in Microsoft Excel and included the following: publication author and date, country, article type, intended audience, clinical population, study objective, specific features of medication guidance, and characteristics of interventions and outcomes. We extracted information from articles that described an intervention according to the validated Template for Intervention Description and Replication (TIDieR) checklist.¹⁷ Articles were summarized and categorized from all sources and according to bibliographic database or gray literature

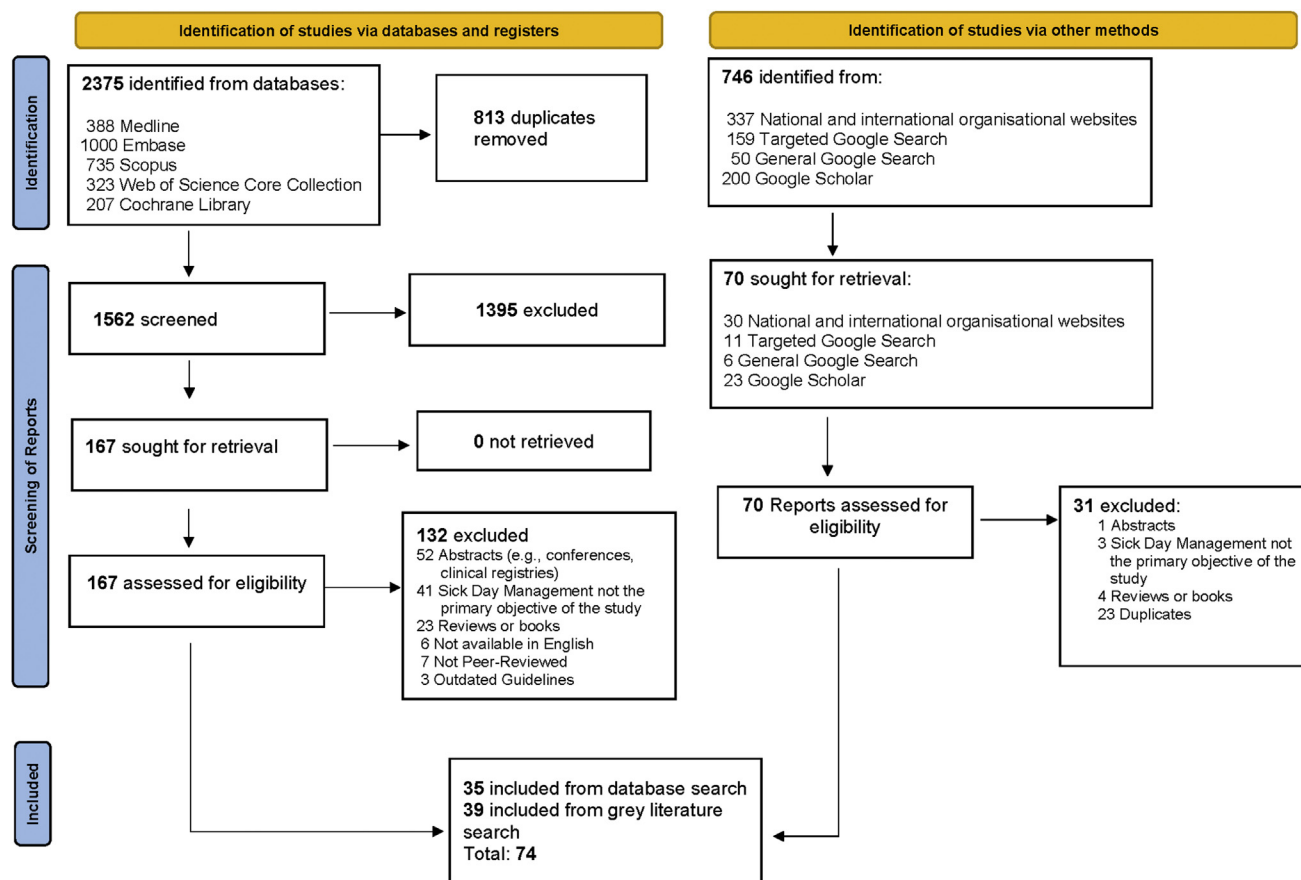


Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-analyses flowchart.

source. Our patient partners were engaged in codeveloping the research question and interpreting and synthesizing the results.

RESULTS

Literature Search

We retrieved 1,562 publications from bibliographic databases (Fig 1). An additional 746 documents were identified from the gray literature search. After title and abstract screening, a total of 237 documents (167 from the bibliographic database search and 70 from the gray literature search) were identified for full text review. After full text review, a total of 74 documents were selected for inclusion in the scoping review (35 from the bibliographic database search and 39 from the gray literature search).

Document Characteristics

The characteristics of the included documents are summarized in Table 1 (see Table S1 for the description of individual documents). Most documents ($n = 55$) were not original research studies and included guidelines ($n = 26$), education resources ($n = 28$), or a position statement ($n = 1$). Only 19 documents reported on primary research studies. Among these, 5 were surveys of patients or health

care providers and 5 were qualitative analyses of interviews with patients and health care providers. There were 10 studies that described an intervention, including 2 usability studies and 3 randomized controlled trials of sick day interventions. The most common outcome was patient knowledge in 9 studies, followed by patient or provider experience in 6 studies and usability in 2 studies. Only 4 research studies were identified that included clinical outcomes.

The majority of documents ($n = 46$) were written for health care providers; however, 28 documents were intended as resources for delivery to patients. Fifty-two documents provided specific guidance related to medications; however, only 10 documents described the development, implementation, or evaluation of a sick day medication intervention. Thirty-two of the documents were from the United Kingdom, with the remaining documents largely coming from the United States ($n = 20$), Canada ($n = 8$), and Australia/New Zealand ($n = 8$). Fifty-eight documents were intended for people with diabetes mellitus, 9 documents were intended for people with chronic kidney disease, 2 documents were intended for people with heart failure, and 5 documents were intended for people at a risk of acute kidney injury.

Table 1. Characteristics of Documents on Sick Day Medication Guidance

	Database Search, n (%) Documents (N = 35)	Gray Literature Search, n (%) Documents (N = 39)	Total, n (%) Documents (N = 74)
Type of document			
Primary research study (n = 19)	19 (54%)	0	19 (26%)
Surveys (patients & health care providers)	5 (26%)	-	-
Qualitative study	5 (26%)	-	-
Randomized control trial	3 (16%)	-	-
Usability testing	2 (11%)	-	-
Observational study	1 (5%)	-	-
Pre–post intervention comparison	1 (5%)	-	-
Cost analysis	1 (5%)	-	-
Mixed methods	1 (5%)	-	-
Nonoriginal research (n = 55)	16 (46%)	39 (100%)	55 (74%)
Guidelines	11 (31%)	15 (38%)	26 (35%)
Educational resource	5 (14%)	23 (59%)	27 (38%)
Position statement	0	1 (3%)	1 (1%)
Audience intended for			
Patients	5 (14%)	23 (59%)	28 (38%)
Health care providers	30 (86%)	16 (41%)	46 (62%)
Age group intended for			
Children (lesser than 18 y)	9 (26%)	3 (8%)	12 (16%)
Adults	26 (74%)	36 (92%)	62 (84%)
Country of origin			
England/United Kingdom	10 (29%)	22 (56%)	32 (43%)
United States	13 (37%)	7 (18%)	20 (27%)
Canada	1 (3%)	7 (18%)	8 (11%)
Australia	6 (17%)	0	6 (8%)
New Zealand	2 (6%)	0	2 (3%)
India	1 (3%)	1 (3%)	2 (3%)
Iraq	1 (3%)	0	1 (1%)
Saudi Arabia	1 (3%)	0	1 (1%)
Not specified	0	2 (6%)	2 (3%)
Clinical populations			
DM (type not specified)	14 (40%)	15 (38%)	29 (39%)
Type 1 DM	8 (23%)	9 (23%)	17 (23%)
Type 2 DM	3 (9%)	9 (23%)	12 (16%)
CKD	8 (23%)	1 (3%)	9 (12%)
Patients at risk of AKI	1 (3%)	4 (10%)	5 (7%)
Heart failure	1 (3%)	1 (3%)	2 (3%)
Provided medication advice			
Yes	20 (57%)	32 (82%)	52 (70%)
No	15 (43%)	7 (18%)	22 (30%)
Described an intervention			
Yes	10 (29%)	0	10 (14%)
No	25 (71%)	39 (100%)	64 (86%)

Abbreviations: AKI, Acute kidney injury; DM, diabetes mellitus; CKD, chronic kidney disease.

Characteristics of Sick Day Medication Guidance

We identified 52 documents that provided some form of instruction about medication use on sick days. The frequency of guidance related to specific medications and chronic conditions is summarized in Fig 2.

Thirty-six documents included instructions for administering insulin, with the nature of the guidance ranging

from very general (ie, adjust insulin but never stop) to very specific instructions (ie, specific units or percentages of adjustment according to blood glucose or ketone levels). A recommendation to temporarily stop metformin was included in more than 50% of documents (n = 29).^{8,11,18-44} Diabetes Canada used an acronym to help remind users of medications that should be stopped—SADMANS

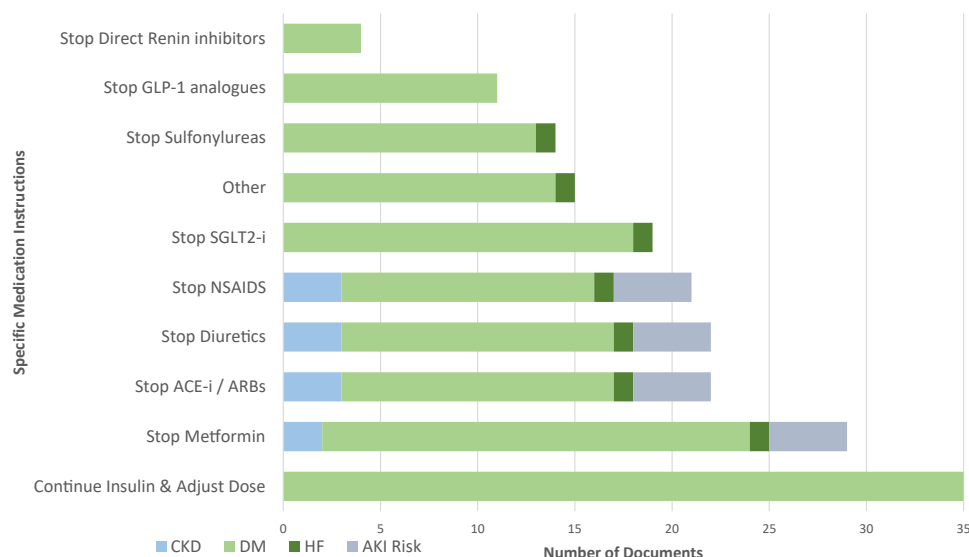


Figure 2. Specific sick day medication guidance by chronic condition. Abbreviations: ACE-i/ARB, angiotensin converting enzyme inhibitor/angiotensin receptor blocker; AKI, acute kidney injury; CKD, chronic kidney disease; DM, diabetes mellitus; GLP-1, glucagon-like peptide 1; HF, heart failure; NSAIDs, nonsteroidal anti-inflammatory drugs; SGLT2-i, sodium/glucose cotransporter 2 inhibitor.

(sulfonylureas, angiotensin converting enzyme inhibitors, diuretics/direct renin inhibitors, metformin, angiotensin receptor blockers, nonsteroidal anti-inflammatory drugs, and sodium/glucose cotransporter 2 inhibitors)—which was included in 3 documents.^{11,30,33}

Specific recommendations for sulfonylureas varied; of the 17 documents that provided recommendations, 7 included instructions to stop them,^{8,11,20,30,33,34,36} 6 included instructions to stop them only when hypoglycemia is present,^{26,38-42} and 4 recommended to continue to take them and/or increase the dose temporarily.^{31,35,37}

Ten articles included instructions to stop glucagon-like peptide 1 receptor agonists with the development of abdominal pain.^{26,29,32,35,37-42} The other category instructions were infrequently provided and included: (1) stopping warfarin in 1 document,³⁰ (2) stopping angiotensin receptor-neprilysin inhibitor (sacubitril/valsartan) in 1 document,³⁶ (3) instructions to continue taking diabetes medications in 4 documents,^{24,45-47} and (4) instructions in 6 documents for patients with heart failure taking 2 or more tablets of furosemide to seek advice from their health care provider before stopping the diuretic.^{26,36,38-42}

Four primary research articles^{11,19,20,44} and 16 professional organizations' documents from the gray literature included instructions to stop sodium/glucose cotransporter 2 inhibitors during an acute illness.^{8,26,29,30,32-42,48}

Twenty-one documents were identified that included instructions for withholding nonsteroidal anti-inflammatory drugs, and 22 documents mentioned withholding diuretics for patients with diabetes, heart failure, or chronic kidney disease and those at risk of acute kidney injury.

Modes of Delivery

Of the 43 documents that provided material for patients, 23 included a handout or posters that could be used by patients (Fig 3).^{8,18,22,23,25,31,33-37,42,44,46,49-57} Additionally, 9 documents were publicly available on webpages,^{29,45,48,58-63} 4 documents referred to wallet-sized cards with instructions for use by patients,^{21,27,28,64} and 3 referred to telephonic support. Two studies reported on an interactive tool for delivering sick day medication guidance^{65,66}; 1 was a website algorithm specific to insulin adjustment for children with diabetes mellitus, and the content of the other was neither described nor publicly accessible. There was 1 document that described the use of sick day medication guidance using prescription notes and dispensing labels.⁴³

Intervention Studies

Ten studies were identified that included an intervention, which are characterized using the TIDieR checklist¹⁷ in Table 2. Two studies tested interventions for providing sick day medication guidance within clinical care,^{21,67} 5 studies tested educational interventions to improve patient knowledge,^{18,23,51,65,68} 2 studies evaluated telephonic support for patients,^{69,70} and 1 study compared the methods of ketone monitoring.⁵⁰ The characteristics of usability studies and randomized controlled trials are provided in Item S2 and Table S2.

DISCUSSION

In this scoping review, we identified 74 documents on sick day medication guidance for patients with diabetes, kidney

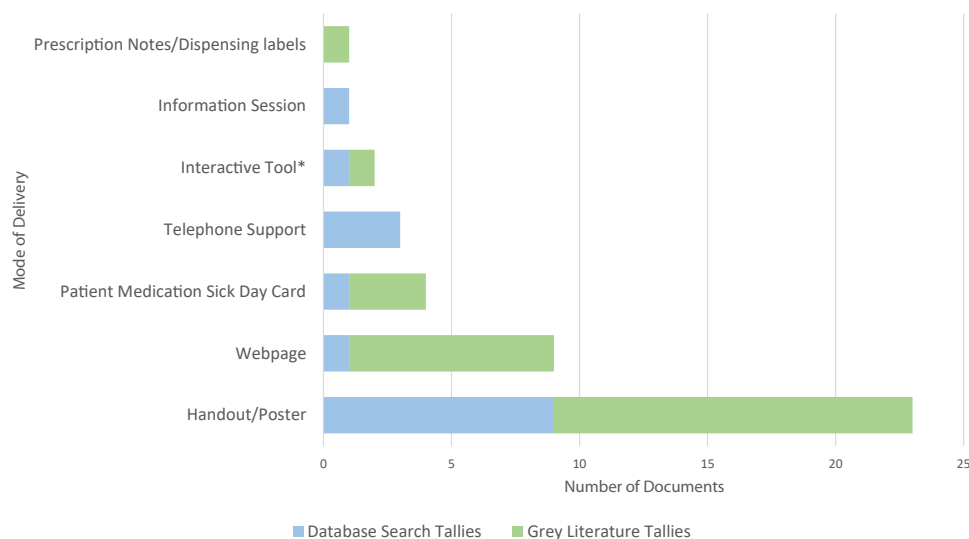


Figure 3. Modes of delivery of patient education on sick day medication guidance. One interactive tool was not described beyond being a safety tool and the other was an insulin dose adjustment tool for parents of children with type 1 diabetes mellitus.

disease, or cardiovascular disease, with the majority being educational resources and guidelines and only a quarter being primary research studies. These research articles were predominantly focused on insulin management for patients with type 1 diabetes mellitus and can be used to inform strategies to provide education and improve patient knowledge for self-management in the setting of acute illness. Importantly, we found that sick day medication guidance was curated largely through expert opinion and was supported by very little primary research on effectiveness, which suggests a need for additional research on usability and effectiveness, particularly for patients with type 2 diabetes, kidney disease, or cardiovascular disease.

Perhaps the single most striking finding from our review was the disparity between the volume of educational documents and sick day medication guidance instructions directed to patients and the low number of primary research studies assessing the knowledge, usability, and effectiveness of these instructions and strategies. We identified very limited evidence of the effectiveness of sick day medication interventions. This may be because, despite its theoretical appeal, implementing and evaluating sick day medication guidance is challenging for several reasons. First, delivering sick day medication guidance requires patient education on self-management strategies, communication with health care providers, and tools to translate the guidance into practice, which require sophisticated design and development efforts. Second, patients with these conditions may only experience sick days infrequently, which makes it difficult to evaluate in prospective studies. Third, the medications used by individual patients, the way they are taken, and the indications for their use may vary widely between patients, making it challenging to design standardized interventions. These

challenges likely underlie the relative paucity of studies evaluating sick day medication interventions and highlight the importance of studies to identify effective implementation strategies as well as impacts on patient-centered outcomes.

We identified not only many common elements in the content of sick day medication guidance but also inconsistencies in recommendations about how sick day medication guidance should be applied, with little evidence upon which to make clinical recommendations. The UK National Institute for Health and Care Excellence 2013 guidelines⁷¹ stated that although there were no clinical studies evaluating continuation versus stopping renin-angiotensin-aldosterone system medications in patients with acute illness, it is proposed that patients faced lower risks with temporarily stopping them than those faced with continuing therapy. Thus, on the basis of the consensus of the experts on the guideline committee, they recommended that patients should be advised to temporarily withhold renin-angiotensin-aldosterone system inhibitors with any hypovolemic illness or infection.⁷¹ However, the UK National Institute for Health and Care Excellence 2019 guidelines reduced the strength of this recommendation to a suggestion for health care providers to use professional judgment and consider temporarily stopping renin-angiotensin-aldosterone system inhibitors only with “diarrhea, vomiting or sepsis until their clinical condition has improved and stabilized.”^{9,72} Furthermore, the Think Kidneys UK Programme Board has recommended that sick day medication guidance not be routinely provided to all patients on at-risk medications but that health care providers assess individuals’ risk of acute kidney injury and make a clinical judgment whether sick day medication guidance is appropriate.^{9,10} The findings of our scoping review further illustrate why it is

Table 2. Intervention Studies Characterized using the TIDieR Checklist¹⁷

Authors	Year	Country	Risk Group	Intervention Name	Why	What (Materials)	What (Procedures)	Who Provided	How	Where	When & How Much	Tailoring	Modifications	How Well-Planned	How Well - Actual
Fink et al ⁶⁷	2017	United States	CKD	SDP and weekly remote monitoring	Improve sick day management in people with CKD	Not specified	Not specified	Not specified	Not specified	Baltimore Veteran Affairs Medical Center	Not specified	Not specified	Not specified	Not specified	Not specified
Martindale et al ²¹	2017	England	Patients at risk of AKI	"Medicine sick day guidance" card	To reduce the risk of avoidable harm to patients taking certain medications	The card provided advice about the management of medicines during episodes of acute illness. An information leaflet was provided to clinicians and administrators suggesting how to use and give the cards	Phase 1: cards and information leaflets were given to patients on certain medicines. Phase 2: pharmacists contacted and educated patients on SDP, completed a medicine review, and issued the patient the SDP card	Primary care (GPs and pharmacists)	In person during GP or pharmacist visits. In addition, patients were contacted if they fit the criteria	General practices (48) and community pharmacies (60) in Salford	In person during GP or pharmacist visits. In addition, patients were contacted if they fit the criteria	Clinicians tailored their delivery of the intervention	Cards made readily available to patients on counters or mailed out	Adherence and fidelity were not formally assessed	Recruitment challenges
Bowman et al ⁶⁵	2020	United States	CKD	Education - mobile tablet-based educational tool	To promote patient awareness and usability of relevant safety topics in CKD (including SDP)	Audio explanations with photographs of medications to be withheld during volume depletion, linked with scenarios of a patient experiencing volume depletion	Assessment of patient knowledge of CKD safety using 2 scenarios with visual and audio	Moderator	One-on-one education and assessment by interactive tool with moderator present	outpatient CKD clinics at Duke University Hospital	Once, assessment followed immediately after the education session	Not specified	Not specified	90% of participants completed >90% of the tasks without critical errors. 5 participants completed all tasks without any errors	User satisfaction of interactive education tool was rated high
Doerfler et al ¹⁸	2019	United Kingdom	CKD	Education -session on SDP and qualifying illnesses	To determine the usability of SDP cards for people with CKD	SDP cards describing when experiencing a gastrointestinal, fever-related, or volume-depleted illness to withhold specific medications until after 24-48 h of being well again. 5 classes of medications: ACE-I, ARBs, diuretics, NSAIDs, and metformin	Assessment of patients' ability to correctly identify qualifying illnesses and which medications would be withheld in each of the 4 scenarios	Moderator	One-on-one, in-person education and assessment with moderator	Not specified	Once, assessment followed immediately after the education session	Not specified	Not specified	19 participants correctly identified which scenario qualified for SDP; however, only 1 participant completed the task of identifying which medications to be withheld completely error free	Not specified

(Continued)

Table 2 (Cont'd). Intervention Studies Characterized using the TIDieR Checklist¹⁷

Authors	Year	Country	Risk Group	Intervention Name	Why	What (Materials)	What (Procedures)	Who Provided	How	Where	When & How Much	Tailoring	Modifications	How Well - Planned	How Well - Actual
Pichert et al ⁶⁸	1994	United States	T1DM	Education - Anchored instruction	Assess if anchored instruction is superior than traditional direct instruction	Scenario video 9 sick day guidelines	Anchored instruction that includes both factual content and problem solving of a real-life scenario. Participants need to identify and address self-care problems	Diabetes nurse educator	2 × 45 min education sessions	Tennessee Camp for Diabetic Children	Pre- and postintervention and an 8 mo follow-up knowledge test	Not specified	Not specified	Not specified	Works better in small groups over several sessions than one-on-one single sessions
Vicary et al ²³	2020	New Zealand	Patients at risk of AKI	Education	To determine response from patients on SDP education from pharmacists	Sick day guidance sheet	Verbal instructions from pharmacist, handout of the sick day guidance sheet, and \$20 honorarium	Pharmacist	In person at pharmacy visit for medication refill	Four community pharmacies located in Napier (n = 2), Hastings (n = 1), and Havelock North (n = 1) in New Zealand	Education given once at enrollment, participants invited to complete a survey and an interview. Study went for 12 mo	Not specified	Not specified	Assessed interviewed participants memory of receiving the education and the location of the handout	58% recalled the education. 45% had retained and knew the location of the sick day guidance sheet
Vitale et al ⁵¹	2015	United States	T1DM	Education	To evaluate impact of education intervention on knowledge of DKA	Handout of SDP for insulin delivery mode with magnetic backing	Clinician reviewed the SDP with patients and care partners and provided handout	diabetes clinicians (physicians, advanced practice nurses, or certified diabetes educators)	In-person consultation	Not specified	Once during a clinic visit	Not specified	Not specified	Follow-up knowledge test for retention 6-12 mo after intervention	Study reported better knowledge scores and less ER visits post intervention
Farrell and Holmes-Walker ⁷⁰	2011	Australia	T1DM	24 h mobile phone support	To determine the impact of mobile phone support on reducing sick day related hospitalizations	Not specified	24-h mobile phone number to call for support	Not specified	On-call support	Diabetes Transition Support Program, Westmead Hospital	Not specified	Not specified	Not specified	Not specified	Not specified
Farrell et al ⁶⁹	2019	Australia	T1DM	Extended mobile phone support (8 am-8:30 pm)	To explore impact of mobile phone support on SDP	Not specified	Clinic mobile phone number to call for support in SDP	Not specified	On-call support	Diabetes Transition Support Program, Westmead Hospital	Not specified	Not specified	Not specified	Not specified	Not specified
Laffel et al ⁵⁰	2006	United States	T1DM	Blood 3-hydroxybutyrate (3-OHB) ketone monitoring + BGL	Assess if blood 3-hydroxybutyrate (3-OHB) ketone monitoring is superior to urine ketone monitoring in reducing hospitalizations	All participants were provided with logbooks containing the SDP for either the 3-OHB or urine ketone groups	All participants were provided with education on sick day management	Not specified	Not specified	Joslin Diabetes Center or the New England Diabetes and Endocrinology Center in Massachusetts	baseline and 3-mo	Not specified	Not specified	Not specified	Not specified

Abbreviations: 3-OHB, 3-Hydroxybutyrate; ACE-I, angiotensin converting enzyme inhibitor; AKI, acute kidney injury; ARB, angiotensin receptor blocker; BGL, blood glucose level; CKD, chronic kidney disease; DKA, diabetic ketoacidosis; ER, emergency room; GP, general practitioner; NSAIDs, nonsteroidal anti-inflammatory drug; SDP, sick day protocol; T1DM, type 1 diabetes mellitus; TIDieR, Template for Intervention Description and Replication.

difficult to make broad clinical recommendations on the basis of the current evidence base available.

To our knowledge, our review is the first to attempt to systematically characterize the literature on sick day medication guidance. A prior systematic review published in 2016 examined the effect of temporary suspension of medications and reported low quality evidence that withdrawal of renin-angiotensin-aldosterone system inhibitors reduced the risk of acute kidney injury on the basis of 6 studies, all in hospital settings.⁴ No studies based in community settings were identified in that review.⁴ Our scoping review provides an updated and broadened review of the literature and summarizes primary research and nonresearch documents related to sick day medication guidance in the community setting that were not addressed by the focused question of that prior review. Our scoping review helps to map key concepts underpinning sick day medication guidance and the main sources of evidence available. Importantly we have identified several gaps in the literature, particularly those related to the efficacy of the guidance and the effectiveness of interventions, which can be used to guide future research priorities in this field. The variability in sick day medication guidance instructions identified in this scoping review highlights areas of uncertainty, and additional areas of research need to support current professional organizations' guidelines and produce findings more relevant to patients. To address these knowledge gaps, robust evidence is needed on the effectiveness of sick day medication guidance to support clinical practice and provide clear guidelines for health care providers. This will require further research to establish expert consensus in areas of inconsistency in current sick day medication guidance and to codesign tools and processes for sick day medication guidance that meet the needs of patients and health care providers. Ideally, there should be a consideration of theory-based implementation strategies to ensure that sick day medication guidance is feasible for patient self-management when experiencing an acute illness in the community setting. Further evaluation of the usability and feasibility testing of novel intervention strategies will be required to inform larger intervention trials.

Our findings should be interpreted while recognizing the purpose of performing a scoping review, which was intentionally designed to characterize the breadth of the literature on sick day medication guidance and identify gaps in knowledge rather than to assess the quality or perform a quantitative synthesis of evidence, which would be the purpose of a traditional systematic review and meta-analysis. Thus, this scoping review does not provide conclusions about the best way to deliver sick day medication guidance or its effectiveness in clinical care. It is also possible that our search was not exhaustive because we imposed some limitations on our bibliographic database and gray literature searches and limited to literature published in English. Nevertheless, we identified many educational documents that highlighted areas of consistency and variability in

content and delivery of sick day medication guidance, only 6 articles written in other languages were excluded, and we do not expect that our search missed important primary research studies that would significantly change our main findings of gaps in knowledge related to evidence of the effectiveness of sick day medication guidance and its relevance to patients, clinicians, and guideline developers. Finally, it can be difficult to extract accurate data in all domains of interest because of limitations of reporting objectives, methods, and results in the original publications, which is reflected in the individual descriptions of some documents in our review.

We have characterized common features as well as variability in sick day medication guidance provided in existing literature and highlighted significant gaps in the evidence base for its usability and effectiveness. Our findings suggest a need for further research to evaluate the effectiveness of sick day medication guidance on patient-centered outcomes. Accessible and usable approaches to the implementation of sick day medication guidance within patient self-management strategies are needed to accompany these empirical studies on effectiveness and inform recommendations for their delivery to patients with diabetes, kidney disease, or cardiovascular disease in the community setting.

SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

Item S1: Detailed Search Strategies

Item S2: Description of Usability Studies and Randomized Controlled Trials

Table S1: Individual Study Characteristics

Table S2: Randomized Controlled Trials Characteristics

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