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Sustainability of professionals' adherence to clinical practice guidelines in medical care: a systematic review

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43 ABSTRACT

 Objectives To evaluate the sustainability of professionals' adherence to guideline recommendations
 45 in medical practice more than one year following the cessation of active implementation.

Design Systematic review

47 Data sources Searches were conducted till June 2014 in MEDLINE, CINAHL, EMBASE, Cochrane 48 Central Register of Controlled Trials (CENTRAL) and the Guidelines International Network (GIN) 49 library. A snowball strategy, in which reference sections of other reviews and of included papers were 50 searched, was used to identify additional papers.

51 Eligibility criteria Studies needed to be focused on sustainability and on professionals' adherence to 52 clinical practice guidelines in medical care. Studies had to include at least two measurements: one 53 before (PRE) or immediately after implementation (EARLY POST) and one measurement longer than 54 one year after active implementation (LATE POST).

Results The search retrieved 3950 items, of which thirteen studies met the inclusion criteria, involving seventeen sustainability evaluations. The mean timeframe between the end of active implementation and the sustainability evaluation was 2.7 years [min 1.5 - max 7.0]. The studies were heterogeneous with respect to their methodology. Sustainability was considered to be successful if performance in terms of professionals' adherence was fully maintained in the late post-implementation phase. Long-term sustainability of professionals' adherence was reported in 41% of the evaluations (7 out of 17), adherence was not sustained in five evaluations, four evaluations showed mixed sustainability results and in one evaluation it was unclear whether the professional adherence was sustained.

Conclusions Professionals' adherence to a clinical practice guideline in medical care decreased after more than one year after implementation in about half of the cases. Due to the limited number of studies, the absence of a uniform definition, the high risk of bias, and the mixed results, no firm conclusion about the sustainability of professionals' adherence to guideline recommendations in medical practice can be drawn.

Key words: sustainability, clinical practice guidelines, medical care, quality improvement,
 implementation, adherence

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3 4	00	Altore cullinary
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12	85	Strengths and limitations of this study
13 14	86	- This is the first systematic review of the literature that has considered professionals'
14	87	adherence to clinical practice guidelines more than one year after active implementation.
16	88	This review shows that in half of the sustainability studies professionals fully sustained in
17 18	89	their adherence to a clinical practice guideline.
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20 21		- This review showed that sustainability research is a relatively new and underexplored field
22	91	in health care.
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26	94	- Sustainability research is not well indexed in electronic databases, and text word searches
27 28	95	are prone to high recall and low specificity. However, it is likely that the use of a broad
20 29	96	variety of search terms that covered sustainability, has downsized the number of relevant
30	97	studies missed and is a strength of the review.
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33		- The number of studies and the methodological quality of the studies focusing on the
34 35	99	sustainability of professionals' adherence are limited. This makes it difficult to draw firm
36	100	conclusions.
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115 INTRODUCTION

 More than ever, improving healthcare performance is necessary due to limited budgets, increased demand and the continuous development of innovations. Quality of care can be improved by decreasing unwarranted practice variation between professionals. One way to reduce practice variation is by transferring evidence-based knowledge into daily practice. To facilitate the translation of the most recent evidence into practice, guidelines are developed and implemented. Following the Institute of Medicine (IOM), clinical practice guidelines are "statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefit and harms of alternative care options" (1). Guidelines contain practical evidence based advice for professionals and patients and aim to improve the quality of care (2). In general, uptake of guidelines does not happen spontaneously and often an active implementation approach is required (3). Moreover, once a guideline is successfully implemented in practice, it may be difficult to sustain the quality improvements over a longer period of time. People tend to fall back into old routines (4) which may impact long-term adherence to a guideline.

The road towards sustainability of health care innovations into practice is suggested to be a dynamic process (5) and sustainable adherence may not be self-evident without continued efforts. Sustainable change of professionals' behaviour has the potential to result in more optimal health care delivery and efficiency. Not sustaining quality improvements can result in nihilistic attitudes towards future innovation. In recent years, sustainability has gained attention in healthcare. Unfortunately, the concept of sustainability is still underdeveloped (6, 7). Some existing reviews studied sustainability from a wide health care perspective, including studies varying from medical care to public health. Results showed that determinants of sustainability varied widely between healthcare areas (8, 9) and suggest that partial sustainability of health care innovations is more common than full sustainability (10).

140 In this systematic review, the scope of sustainability research will be narrowed to professionals' 141 adherence to clinical practice guidelines in medical care. The aim of the current review was to 142 evaluate the level of sustained professionals' adherence to guideline recommendations in medical 143 practice more than one year following the cessation of the implementation project.

METHODS

146 Eligibility criteria

147 Studies needed to be focused on sustainability and on clinical practice guidelines. Sustainability was 148 described as "Sustainability of change exists when a newly implemented innovation continues to 149 deliver the benefits achieved over a longer period of time, certainly does not return to the usual 150 processes and becomes 'the way things are done around here' (11), even after the implementation 151 project is no longer actively carried out, until a better innovation comes along" (12). Studies had to 152 include at least two measurements: one before (PRE) or immediately after implementation (EARLY 153 POST) and one measurement longer than one year after active implementation (LATE POST). All

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activities to facilitate the adherence to clinical practice guidelines were labelled as part of the implementation project. Studies needed to be focused on professionals' adherence to a clinical practice guideline. Studies only using self-reported adherence were excluded to reduce the chance of social desirability bias and an overestimation of results (13). Lastly, studies had to focus on medical care. Participants had to be healthcare professionals who deliver direct patient care. There were no restrictions on study design of the research articles.

161 Search methods for identification of studies

162 Electronic searches

We searched MEDLINE (OvidSP) (1946- February 2014). CINAHL (EBSCO Host) (1982- February 2014), EMBASE (OvidSP) (February 2014), Cochrane Central Register of Controlled Trials (CENTRAL) and the Guidelines International Network (GIN) library for studies. The electronic search strategy was designed to focus on sustainability of guideline recommendations. Free text terms and MeSH terms regarding sustainability, quality improvement, impact and guideline recommendations were used. An information expert checked the developed search strategies (supplementary file 1). Before final analyses, update searches were performed to identify possible additional studies (June 26. 2014).

172 Searching other resources

A snowball strategy was performed, in which the reference sections of reviews (6-10, 14) and research papers on sustainability (15, 16) were searched. Also, databases such as PubMed and the Web of Knowledge Science Citation Index were used to locate publications and publications citing the original references. The process was repeated for any new relevant publication found. BMJ Open: first published as 10.1136/bmjopen-2015-008073 on 29 December 2015. Downloaded from http://bmjopen.bmj.com/ on June 13, 2025 at Agence Bibliographique de Enseignement Superieur (ABES)

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178 Data collection and analysis

179 Selection of studies

All records were merged into a bibliographic database and screened independently by two reviewers (SA, JdG) based on title and abstract. Full text screening was performed by two reviewers (SA, JdG). Disagreement on selection was resolved in consensus meetings with a third reviewer (TvW). Reasons for exclusion were documented during the full text screening. If more clarification or details of a study were needed, an author was contacted. Authors of conference abstracts were emailed and were asked to send the research protocol. Duplicate papers were identified and all papers published on one study were used for retrieving information.

188 Data extraction and management

Data of the methodology and results were independently extracted by two reviewers (SA, JdG), guided by a predefined data extraction form. Effective Practice and Organisation of Care (EPOC) Data Collection Checklist (17) items (e.g. location of care, type of targeted behaviour, implementation interventions) were integrated in the data extraction form. The data extraction form was developed by the authors and was pilot tested. The following study characteristics were recorded: study design, publication year, whether the study was executed in a single centre or in multiple centres, type of targeted behaviour, location of care, the name of the clinical practice guideline, clinical specialty, the implementation activities used and whether or not the implementation strategy was externally guided. An externally guided implementation strategy is a strategy which is lead and supported by an external expert organisation. With respect to the methodology of the sustainability evaluation the following data were extracted: the timeframe between the end of the implementation strategy and the sustainability evaluation, the applied definition of sustainability, the data collection method, whether the evaluation was performed on patient, hospital or multiple hospital level and whether the sustainability evaluation was performed on single or multiple centre level. With respect to the outcome measures of the studies, data on the professionals' adherence rates before, early after implementation and longer than one year after implementation, and the authors' comments with respect to the sustainability of professionals' adherence were extracted. Adherence was presented in terms of proportion of patients receiving treatment according to the clinical practice guideline recommendations. If sustainability of professionals' adherence to a clinical practice guideline was evaluated at multiple post-implementation moments, the latest evaluation was selected as LATE POST measurement. The authors (SA and JdG) checked if updates of the clinical practice guidelines had become available in the post-implementation phase (e.g. between the EARLY POST and the LATE POST measurement), which may explain reduced professionals' adherence. Disagreement on data extraction was resolved in consensus meetings with a third reviewer (TvW).

214 Assessment of risk of bias in included studies

Risk of bias assessment was independently conducted by two authors using the Downs and Black checklist for randomized and non-randomized studies (18). This is a checklist which can be used for checking the risk of bias of original research articles of various study designs. Results were interpreted under consideration of risk of bias. The assessments were also used for recommendations for further research by identifying elements of studies that can be improved in future studies. The checklist was adapted to the research question. Risk of bias of the studies was presented on reporting, external validity, internal validity (bias and confounding), power and overall level.

223 Analysis

The analysis was narrative. This included a summary of the methodological characteristics of the sustainability evaluations, and the level of sustained professionals' adherence compared to results achieved immediately after implementation. Sustainability was considered to be successful if performance in terms of professionals' adherence was fully maintained in the late post-implementation

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phase. A sensitivity analysis was performed by applying a 90% instead of 100% adherence criterion ofsustainability.

RESULTS

232 Description of studies

For this review, 3950 items were retrieved and screened based on title and abstract, and 174 studies were assessed based on full text reading. Figure 1 shows the study selection process as recommended by the PRISMA statement (19) (supplementary file 2). Thirteen studies met the inclusion criteria for this review, describing seventeen sustainability evaluations (20-32). Table 1 presents the characteristics of the included studies. Two publications were published before and eleven after 2000 (21, 31). In five studies the targeted behaviour was prescribing (22, 23, 26, 28, 31), in four studies procedures (27, 29, 30, 32), in three studies general management of a problem (20, 24, 25) and in one study (21) general management of a problem and prescribing. The location of care was inpatient in six studies (21, 26, 27, 30, 32), outpatient in three studies (22-24) and mixed in five studies (20, 25, 28, 29, 31).

The implementation strategy was described in twelve studies (supplementary file 3) (20-25, 27-37). According to the EPOC checklist classification, in one study (22), a single element implementation strategy was executed while in the other eleven studies a multi-faceted implementation strategy was executed. Implementation activities were professional targeted interventions (n=11) (20, 21, 23-25, 27, 28, 30-37), followed by organisational interventions (n=6) (20, 21, 24, 31-34, 36, 37) and financial interventions (n=1) (25). In five studies the implementation strategy was facilitated by external experts (20, 23-25, 29). In one study it was unclear whether the implementation strategy was externally supported (26).

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Study ID			Clinical specialty	Clinical practice guideline was updated in the post-implementation phase* (yes/no)	Time frame (years)	
Ament (20) (2014) The Netherlands	case series	Guideline to facilitate short stay for breast cancer surgery Surgery (33)		Between 2007-2012: No (38, 39)**	5	
Benenson (21) (1999) UK	case series	Clinical pathway for pneumonia (40)	Various	Between 1995-1997: No (41, 42)	3	
Cates (22)(2009) UK	case series	Guideline for antibiotic prescription for children with earache and inflamed eardrums who are not unduly ill (43)	General practice	Between 1998-2001: No (44)**	Centre 1: 3 Centre 2: 2	
Enriquez-Puga (23) (2009) UK	RCT	(43)General practice(1) Antidepressant prescription guideline and (45) (2)General practiceGuideline 1 between 2003-2004: yes (47)Control group: intervention groups were each other's control groupGuideline 2 between 2003-2004: No (46)			1.5	
Forsner (24) (2010) Sweden	RCT	Clinical guideline (1) for depression (48) and (2) for suicidal behaviours (49) Control group: received the guideline but were not included in the intervention	Psychiatry	UTD	1.5	
Higuchi (25) (2011) Canada	case series	 (1) Adult Asthma Care Best Practice Guideline (50) and (2) Reducing Foot Complications for People with Diabetes Best Practice Guideline (51) 	(1)Various (2)Various	Guideline 1 between 2002-2006: Yes (52) Guideline 2 between 2003-2006: Yes (53)	(1) 4 (2) 3	
Kelly (26) (2000) Australia	case series	Guideline for nurse managed titrated narcotic analgesia (54)	Emergency medicine	UTD	2	
Knops (27) (2010) The Netherlands	case series			7		
Loszadi (28) (2006) UK	case series	Guidelines for the prevention and management of corticosteroid induced osteoporosis (56)		UTD	Unknown > 2	
Mclaws (29) (2009) Australia	case series	Guidelines on Hand Hygiene in Health Care (57)	Various	Between 2007-2008: No (57)	1.5	
Stephan (30) (2006)	case series	Guideline for urine catheterization management for surgical procedures (58)	Orthopaedic / abdominal	UTD (local guideline)	1.5	

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Switzerland			surgery		
Nakefield (31) 1998) USA	case series	Guideline for the use of transdermal fentanyl for chronic pain (31)	Various	UTD	1.5
Villiams (32) 2003) UK	case series	Guideline for the repair and follow-up of third degree tears (59)	Obstetrics and gynaecology	UTD (local guideline)	2
ITD: unable to de		the key recommendations of the guideline. The guideline was a			

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251 Characteristics of the sustainability evaluations

The mean timeframe between the end of the implementation strategy and the sustainability evaluation of twelve studies was 2.7 years [min 1.5 - max 7.0]. The actual timeframe of one evaluation was unclear, but was at least two years (28). Two studies referred to a definition of sustainability (20, 25). Eight studies used a retrospective data collection method (21-27, 31), two studies used a prospective data collection method (29, 30) and three studies used both a prospective and a retrospective data collection method (20, 28, 32). Nine papers reported the level of sustained adherence of a single clinical practice guideline (20-22, 26, 28-32), while four reported the late post-implementation adherence of two clinical practice guidelines (23-25, 27). Seven studies had a single centre design (21, 26-28, 30-32) and six studies evaluated sustainability in multiple centres (20, 22-25, 29). Three out of six multiple centre studies evaluated the sustainability on multiple centre level (20, 24, 29). Two out of six multiple centre studies evaluated the sustainability of professionals' adherence of two guidelines which were implemented in one centre each (22, 25).

265 Sustainability of changed behaviour

The level of professionals' adherence was fully sustained in seven out of seventeen evaluations (table 2, supplementary file 4). The adherence was not fully sustained in five evaluations and four evaluations showed mixed sustainability results in the LATE POST measurement compared to the EARLY POST measurement. In one study, the EARLY POST measurement was not executed, while the authors reported sustained results (26). After decreasing the sustainability level of professionals' adherence to 90% or higher, nine out of seventeen evaluations showed sustained results, two evaluations showed no sustained results, four evaluations showed mixed results. In two evaluations it was unclear whether the professionals' adherence had been sustained at a level 90% or higher.

Five of the nine papers that reported about a single clinical practice guideline presented sustained professionals' adherence to clinical practice guidelines in the LATE POST measurement (20-22, 28, 32). One of these five papers evaluated the sustainability of a single clinical practice guideline in two centres (22). In both centres professionals' adherence had improved in the LATE POST measurement compared to the EARLY POST measurement. The four studies analysing the sustainability of two clinical practice guidelines showed mixed results. Two of these four studies (23, 27), presented the same level or improved adherence to one guideline and decreased adherence to the other guideline in the LATE POST measurement compared to the EARLY POST measurement. The other two of these four studies (24, 25) presented adherence results on guideline recommendation level and did not present overall adherence results on patient level. The adherence to the recommendations of the clinical practice guidelines showed decreased and improved levels in the LATE POST measurement compared to the EARLY POST measurement. In total, eight papers mentioned the term 'sustainability' in the conclusion (table 2) [20-26 30]. Five of these studies concluded to have sustained professionals' adherence in the late post-implementation phase [20-22 26 30], three out of eight studies described to have a 'mixed pattern', 'small desired' or 'almost' sustained professionals' adherence [23-25].

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Study ID	Authors' comments in terms of sustainability of adherence to the clinical practice guideline*	Sustained compared to early implementation results (100%) (yes/no)**	Sustained compared to early implementation results (90%) (yes/no)*
Ament (20)	"Adherence to the guideline recommendations was sustained in four early adopter hospitals"	yes	yes
Benenson (21)	"The observed pre pathway to post pathway differences were sustained over three years"	yes	yes
Cates (22)	(Centre 1 & 2) "our approach has brought about a <i>sustained</i> reduction in the use of antibiotics for children with acute otitis media, and after dissemination of our findings, similar results have been replicated at centre II using deferred prescribing of antibiotics for children who are not unduly ill"	yes	yes
Enriquez-Puga (23)	"There was a small change in the desired direction in the proportion of antidepressants prescribed according to guidelines that lasted for 24 months, although no change for antibiotics. A simple, group level educational outreach intervention, designed to take account of identified barriers to change, appears to have a small <i>sustained</i> effect on prescribing levels, but the effect is not consistent across different groups of drugs"	Guideline 1: no Guideline 2: yes	Guideline 1: no Guideline 2: yes
Forsner (24)	"This study suggested that the compliance to clinical guidelines, for treatment of depression and suicidal behaviour, was implemented and <i>sustained</i> over a two-year period after an active implementation"	Guideline 1: mixed Guideline 2: mixed	Guideline 1: mixed Guideline 2: mixed
Higuchi (25)	(1)" The chart audit revealed that eleven nursing care indicators related to the asthma guideline recommendations showed a mixed pattern of sustainability"	Guideline 1: mixed	Guideline 1: mixed
	(2) Not mentioned	Guideline 2: mixed	Guideline 2: mixed
Kelly (26)	"The study demonstrated a significant and <i>sustained</i> change in analgesia administration practices away from the intramuscular (IM) route in favour of the IV route."	na	na
Knops (27)	(1)Not mentioned (2)Not mentioned	Guideline 1: yes Guideline 2: no	Guideline 1: yes Guideline 2: no
Loszadi (28)	Not mentioned	yes	yes
Mclaws (29)	Not mentioned	no	yes
Stephan (30)	"One of the most important results of our intervention is its <i>sustained</i> impact. In particular, the frequency of catheter use decreased in the operating room not only immediately after guideline implementation, but also could be observed 2 years later."	no	yes
Wakefield (31)	Not mentioned	no	na
Williams (32)	Not mentioned	yes	yes
** The same level or i ***At least 90% of pro na: not applicable as mixed: The overall pro	ors of reviewed papers about the sustainability of adherence to the clinical practice guideline mproved professionals' adherence was achieved years after implementation compared to early post-in ofessionals' adherence was achieved years after implementation, compared to early post-implementation the early post-implementation results were not measured ofessionals' adherence was not presented, and both sustained and not sustained levels of professional re achieved in the late post-implementation phase compared to early post-implementation results.	on results (yes/no)	e guideline
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Risk of bias in included studies

- All studies included in the present review had a high risk of bias, following the Downs and Black
- assessment tool (18) (table 3, supplementary file 5).

Table 3. Results of the risk of bias assessment

Study ID	Reporting	External	Internal	Internal	Total
		validity	validity - bias	validity -	
				confounding	
Ament (20)	Unclear	High	High	High	High
Benenson (21)	Unclear	High	High	High	High
Cates (22)	High	Unclear	High	High	High
Enriquez-Puga (23)	Unclear	High	High	High	High
Forsner (24)	Unclear	Low	High	High	High
Higuchi (25)	High	High	High	High	High
Kelly (26)	High	High	High	High	High
Knops (27)	High	Low	High	High	High
Loszadi (28)	Unclear	High	Unclear	High	High
Mclaws (29)	High	Low	Unclear	High	High
Stephan (30)	High	High	Unclear	High	High
Wakefield (31)	High	High	High	High	High
Williams (32)	High	High	Unclear	High	High
Total	High	High	High	High	High

DISCUSSION

This systematic review identified thirteen studies, including seventeen evaluations that investigated the sustainability of professionals' adherence to a clinical practice guideline more than one year after the implementation was finished. Of seventeen analyses that focused on the extent of sustained professionals' adherence to a clinical practice guideline, seven analyses revealed fully sustained results. After decreasing the sustainability level of professionals' adherence to 90% or higher, nine out of seventeen evaluations showed sustained results. The current review showed that the number of sustainability studies is scarce and that the studies are heterogeneous with respect to their methodology. Furthermore, almost no study analysed or reflected on the updates of the guideline in the post-implementation phase. The results of this review suggest that updates of the clinical practice guidelines may have led to a warranted decrease in the adherence to the original clinical practice guideline.

As was confirmed in another systematic review (10), the sustainability studies showed to have limited methodological rigor. Two out of thirteen studies used an experimental design. The lack of identified

 studies in the current review suggests that most teams do not focus on the long-term performance effect of quality improvements (60). Due to the limited number of studies focusing on this subject, the heterogeneity in studies, suboptimal reporting by authors and the revealed methodological weaknesses, no strong conclusions can be drawn based on the presented sustainability results. As also shown in other research, most sustainability studies used a single-case study design by focusing on a single type of programme or performed the evaluation at a single centre level (61). The current review showed that in only two of the studies, a reference for the definition of sustainability was used. Other studies performed a sustainability evaluation without mentioning a definition. This shows the underdeveloped field of sustainability research. Also, a variety of timeframes to study the sustainability of professionals' adherence to clinical practice guidelines was revealed, varying from one and a half year to seven years following implementation.

Our review focused on the sustainability of implementation success in terms of professionals' adherence. Optimal adherence to a clinical practice guideline as determined during implementation is not always desired; for example, clinical experience and evidence may change. This systematic review included all research designs and seems to be the first review with respect to sustainability of professionals' adherence to clinical practice guidelines to date. Other reviews focused on healthcare from a broad perspective including multiple health care fields (10) or reviewed studies performed specifically in public health (6, 9). The sustainability of a health programme in public health may be influenced by other determinants than the sustainability of a clinical practice guideline in medical care. Also, the concept of the sustainability may differ between healthcare fields. For example, in public health sustainability of a health programme may be successfully sustained if health outcomes, e.g. changed lifestyle, are maintained and financial support is still available (6, 61). In medical care, the primary focus is on the quality and safety of care which is supposed to be captured in clinical practice guidelines. Due to the specific focus on clinical practice guidelines in the current review, mainly other studies were included compared to the existing sustainability reviews (6-10, 14).

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336 Strengths and weaknesses

As yet, the term 'sustainability' is not consistently used for this area in the broader medical field, which presents a limitation to the electronic search strategy. The topic is not well indexed in electronic databases, and text word searches are prone to high recall and low specificity. However, it is likely that the use of a broad variety of search terms that covered sustainability, has downsized the number of relevant studies missed and is a strength of the review.

In this systematic review, sustainability was assessed as successful if performance in terms of professionals' adherence was fully maintained in the late post-implementation phase. Also, a sensitivity analysis was performed to analyse the sustainability at a level of 90% or higher. However, as mentioned before, a limitation of the review is the high risk of bias of all studies included. The majority of the studies used a retrospective data collection method. Nevertheless, results were interpreted under consideration of risk of bias, and the assessments were also used for

recommendations for further research by identifying elements of studies that can be improved in new
studies. Also, the question is what the best method is for evaluating sustainability. For example,
retrospective data may be desired to prevent a Hawthorne effect when studying routine practice.

The results of the current review show more studies with sustained professionals' adherence than might be expected without continuing efforts and support to promote the level of sustained adherence in the post-implementation phase. Possibly, studies with unfavourable results may not be published or unsuccessful implementation projects may not be evaluated, leading to an under-representation of the true amount of work carried out in the field (62, 63).

358 Implications for practice

The current review showed that the level of the sustainability of professionals' adherence to clinical practice guidelines varies on case study level and drops in more than half of the studies. Due to the lack of sustainability research we think that sustainability failure as presented in this study is an underestimation. Unfortunately, implementation projects are primarily focused on short-term actions and short-term effect (60). To guarantee a sustainable health care system, maintaining or improving the level of adherence to clinical practice guidelines achieved after implementation is necessary.

366 Future research

This review complements the existing sustainability research by focussing on sustained professionals' adherence in medical practice. The current review showed that not many studies reported data on the sustainability of professionals' adherence to clinical practice guidelines. Also, no strong conclusions can be drawn due to the high risk for bias and the heterogeneity of the studies. As shown in previous research, structural methods for sustainability evaluations are lacking (10, 64). More sustainability evaluation research and methodological guidance is needed to make future sustainability research more robust and generalizable and may be helpful in creating a general sustainability language.

375 CONCLUSION

This systematic review identified, reported and analysed studies that evaluated the level of sustainability of professionals' adherence to guideline recommendations in medical practice more than one year following the cessation of the implementation project. Seven out of seventeen evaluations showed sustained professionals' adherence on average 2.7 years after implementation. Due to the limited number and the lack of methodological quality of the identified studies, no firm conclusion about the sustainability of professionals' adherence to guideline recommendations in medical practice can be drawn. More sustainability evaluations, methodological sustainability studies and reviews are needed in order to develop a general framework for sustainability measurement and to facilitate uniform language and communication within the sustainability science.

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420 References

 421 1. Graham R MM, Wolman DM, Greenfield S, Steinberg E. Clinical practice guidelines we can
 422 trust. Washington (DC): National Academies Press; 2011.

Thomas LH, McColl E, Cullum N, Rousseau N, Soutter J, Steen N. Effect of clinical guidelines
in nursing, midwifery, and the therapies: a systematic review of evaluations. Quality in Health Care.
1998 December 1, 1998;7(4):183-91.

426 3. Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, et al. Effectiveness
427 and efficiency of guideline dissemination and implementation strategies. Health technology
428 assessment (Winchester, England). 2004 Feb;8(6):iii-iv, 1-72. PubMed PMID: 14960256. Epub
429 2004/02/13. eng.

430 4. Ajzen I. The Theory of Planned Behavior. Organizational Behavior and Human Decision
431 Processes. 1991;50(2):179-211.

432 5. Pluye P, Potvin L, Denis JL, Pelletier J. Program sustainability: focus on organizational
433 routines. Health Promot Int. 2004 Dec;19(4):489-500.

Gruen RL, Elliott JH, Nolan ML, Lawton PD, Parkhill A, McLaren CJ, et al. Sustainability
science: an integrated approach for health-programme planning. Lancet. 2008 Nov 1;372(9649):157989.

437 7. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in
438 service organizations: systematic review and recommendations. Milbank Q. 2004;82(4):581-629.

8. Shediac-Rizkallah MC, Bone LR. Planning for the sustainability of community-based health
programs: conceptual frameworks and future directions for research, practice and policy. Health Educ
Res. 1998 Mar;13(1):87-108.

442 9. Scheirer MA. Is Sustainability Possible? A Review and Commentary on Empirical Studies of
443 Program Sustainability. American Journal of Evaluation. 2005 September 2005;26(3):27.

Wiltsey Stirman S, Kimberly J, Cook N, Calloway A, Castro F, Charns M. The sustainability of
new programs and innovations: a review of the empirical literature and recommendations for future
research. Implementation Science. 2012;7(1):17.

NHS. Sustainability and its relationship with spread and adoption. 2007; Coventry. Available
 from: <u>http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-methodology-</u>
 resources-section/ilg 1.7 substainability and its relationship with spread and adoption.pdf.

Ament SM, Gillissen F, Maessen JM, Dirksen CD, van der Weijden T, von Meyenfeldt MF.
Sustainability of healthcare innovations (SUSHI): long term effects of two implemented surgical care
programmes (protocol). BMC health services research. 2012;12:423. Pubmed Central PMCID:
PMC3545846. Epub 2012/11/24. eng.

454 13. Adams AS, Soumerai SB, Lomas J, Ross-Degnan D. Evidence of self-report bias in assessing
455 adherence to guidelines. International journal for quality in health care : journal of the International
456 Society for Quality in Health Care / ISQua. 1999 Jun;11(3):187-92. Epub 1999/08/06. eng.

457 14. Buchanan D, Fitzgerald L, Ketley D, Gollop R, Jones JL, Lamont SS, et al. No going back: A
458 review of the literature on sustaining organizational change. International Journal of Management
459 Reviews. 2005;7(3):189-205.

460 15. Chambers D, Glasgow R, Stange K. The dynamic sustainability framework: addressing the 461 paradox of sustainment amid ongoing change. Implementation Science. 2013;8(1):117.

1		
2		
3	462	16. Ilott I, Gerrish K, Pownall S, Eltringham S, Booth A. Exploring scale-up, spread, and
4	463 464	sustainability: an instrumental case study tracing an innovation to enhance dysphagia care. Implementation Science. 2013;8(1):128.
5	404	
6	465	17. Cochrane Effective Practice and Organisation of Care Review Group. Data Collection
7	466	Checklist. University of Ottawa: Institute of Population Health; 2011.
8 9	100	
9 10	467	18. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the
10	468	methodological quality both of randomised and non-randomised studies of health care interventions.
12	469	Journal of Epidemiology and Community Health. 1998 June 1, 1998;52(6):377-84.
12		
14	470	19. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews
15	471	and meta-analyses: the PRISMA statement. PLoS medicine. 2009 Jul 21;6(7):e1000097. Pubmed
16	472	Central PMCID: PMC2707599. Epub 2009/07/22. eng.
17	.=-	
18	473	20. Ament SM, Gillissen F, Maessen JM, Dirksen CD, Bell AV, Vissers YL, et al. Sustainability of
19	474 475	short stay after breast cancer surgery in early adopter hospitals. Breast (Edinburgh, Scotland). 2014 Mar 31. Epub 2014/04/05. Eng.
20	475	
21	476	21. Benenson R, Magalski A, Cavanaugh S, Williams E. Effects of a pneumonia clinical pathway
22	477	on time to antibiotic treatment, length of stay, and mortality. Academic Emergency Medicine. 1999
23	478	December;6(12):1243-8.
24		
25	479	22. Cates CJ. Delayed antibiotics for children with acute otitis media: Is practice change
26	480	sustainable? Evidence-Based Medicine. 2009 February;14(1):2-3.
27		
28	481	23. Enriquez-Puga A, Baker R, Paul S, Villoro-Valdes R. Effect of educational outreach on general
29	482	practice prescribing of antibiotics and antidepressants: A two-year randomised controlled trialal.
30	483	Scandinavian Journal of Primary Health Care. 2009;27(4):195-201.
31 32		
33	484	24. Forsner T, Wistedt A, Brommels M, Janszky I, de Leon A, Forsell Y. Supported local
34	485 486	implementation of clinical guidelines in psychiatry: a two-year follow-up. Implementation Science. 2010;5(1):4.
35	400	2010,5(1).4.
36	487	25. Higuchi KS, Davies BL, Edwards N, Ploeg J, Virani T. Implementation of clinical guidelines for
37	488	adults with asthma and diabetes: A three-year follow-up evaluation of nursing care. Journal of Clinical
38	489	Nursing. 2011 May;20(9-10):1329-38.
39		5
40	490	26. Kelly AM. Nurse-managed analgesia for renal colic pain in the emergency department.
41	491	Australian health review : a publication of the Australian Hospital Association. 2000;23(2):185-9.
42		
43	492	27. Knops AM, Storm-Versloot MN, Mank APM, Ubbink DT, Vermeulen H, Bossuyt PMM, et al.
44	493	Factors influencing long-term adherence to two previously implemented hospital guidelines.
45	494	International Journal for Quality in Health Care. 2010 October;22(5):421-9.
46	405	
47	495 496	28. Lozsadi DA, Peters G, Sadik HY, Kellett MW, Fox SH, Smith DF. Prevention of osteoporosis
48	496 497	in glucocorticoid-treated neurology patients. Clinical Neurology and Neurosurgery. 2006 February;108(2):157-62.
49 50	-151	· · · · · · · · · · · · · · · · · · ·
50 51	498	29. McLaws ML, Pantle AC, Fitzpatrick KR, Hughes CF. Improvements in hand hygiene across
52	499	New South Wales public hospitals: clean hands save lives, part III. The Medical journal of Australia.
53	500	2009 19 Oct;191(8 Suppl):S18-24.
54		
55	501	30. Stephan F, Sax H, Wachsmuth M, Hoffmeyer P, Clergue F, Pittet D. Reduction of urinary tract
56	502	infection and antibiotic use after surgery: A controlled, prospective, before-after intervention study.
57	503	Clinical Infectious Diseases. 2006 01 Jun;42(11):1544-51.
58		
59		
60		17

31. Wakefield B, Johnson JA, Kron-Chalupa J, Paulsen L. A research-based guideline for appropriate use of transdermal fentanyl to treat chronic pain. Oncology nursing forum. 1998 Oct;25(9):1505-13. Williams A, Adams EJ, Bolderson J, Tincello DG, Richmond DH. Effect of a new guideline on 32. outcome following third-degree perineal tears: results of a 3-year audit. International Urogynecology Journal. 2003:14(6):385-9. 33. de Kok M. Costs and effects of implementation of a short admission programme following breast cancer surgery in the Netherlands. Rotterdam: Maastricht University; 2010. Ament SMC, De Kok M., Van de Velde C.J.H., Roukema J.A., Bell A.V.R.J., Van der Ent FW, 34. Van der Weijden T., Von Meyenfeldt M.F., Dirksen C.D. Calculating implementation costs using a structured method: implementation of a short stay programme for breast cancer surgery. 2014 Submitted. 35. Mank A, Semin-Goossens A, Lelie J, Bakker P, Vos R. Monitoring hyperhydration during high-dose chemotherapy: body weight or fluid balance? Acta haematologica. 2003;109(4):163-8. Epub 2003/07/11. eng. Storm-Versloot MN, Knops AM, Ubbink DT, Goossens A, Legemate DA, Vermeulen H. Long-36. term adherence to a local guideline on postoperative body temperature measurement: mixed methods analysis. J Eval Clin Pract. 2012 Aug;18(4):841-7. Epub 2011/04/27. eng. 37. Pantle AC, Fitzpatrick KR, McLaws ML, Hughes CF. A statewide approach to systematising hand hygiene behaviour in hospitals: clean hands save lives, part I. Med J Aust. 2009 Oct 19;191(8 Suppl):S8-S12. Epub 2009/10/20. eng. Nationaal Borstkanker Overleg Nederland. NABON-Nota, Handboek organisatie mammazorg 38. Amsterdam2008. Available from: http://www.oncoline.nl/uploaded/docs/mammacarcinoom/NABON%20nota%202008.pdf. Nationaal Borstkanker Overleg Nederland. Richtlijn Mammacarcinoom, landelijke richtlijn 39. 2012. Available from: http://www.heelkunde.nl/uploads/ a/Gk/ aGkhzjRsgiYhbhbFWFETQ/Mammacarcinoom2012.pdf. Niederman MS, Bass JB, Jr., Campbell GD, Fein AM, Grossman RF, Mandell LA, et al. Guidelines for the initial management of adults with community-acquired pneumonia: diagnosis, assessment of severity, and initial antimicrobial therapy. American Thoracic Society. Medical Section of the American Lung Association. The American review of respiratory disease. 1993 Nov;148(5):1418-26. Epub 1993/11/01. eng. Niederman MS, Mandell LA, Anzueto A, Bass JB, Broughton WA, Campbell GD, et al. 41. Guidelines for the management of adults with community-acquired pneumonia. Diagnosis, assessment of severity, antimicrobial therapy, and prevention. American journal of respiratory and critical care medicine. 2001 Jun;163(7):1730-54. Epub 2001/06/13. eng. Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, et al. Infectious 42. Diseases Society of America/American Thoracic Society Consensus Guidelines on the Management of Community-Acquired Pneumonia in Adults. Clinical Infectious Diseases. 2007 March 1, 2007;44(Supplement 2):S27-S72. Centre for Clinical Practice at NICE (UK). Respiratory Tract Infections. Antibiotic Prescribing: 43. Prescribing of Antibiotics for Self-Limiting Respiratory Tract Infections in Adults and Children in Primary Care: London: National Institute for Health and Clinical Excellence (UK); 2008.

547 548 549	44. National Institute for Health and Care Excellence (NICE). Respiratory tract infections – antibiotic prescribing: Prescribing of antibiotics for self-limiting respiratory tract infections in adults and children in primary care [September 16, 2014]. Available from: <u>http://www.nice.org.uk/Guidance/cg69</u> .
550 551	45. Leicestershire Health Authority. Leicestershire evidence based guidelines for the managemen of major depression. 2000.
552 553	46. Health Protection Agency. Management of infection guidance for primary care for consultation and local adaptation. London: HPA2005.
554 555	47. National Institue for health and care excellence (NICE). Depression in adults: The treatment and management of depression in adults. 2004.
556 557	48. Medicinskt programarbete. Regionalt vårdprogram för depressionssjukdomar inkl. mano- depressiv sjukdom. Stockholm Stockholm County Council, 2003.
558 559	49. Medicinskt programarbete. Regionalt vårdprogram. Vård av suicidnära patienter. Stockholm County Council, 2002.
560 561	50. Registered Nurses' Association of Ontario, RNAO . Adult Asthma Care Best Practice Guideline. Toronto: 2002a.
562 563	51. Registered Nurses' Association of Ontario, RNAO. Reducing Foot Complications for People with Diabetes. Toronto: 2004.
564 565 566 567	52. Registered Nurses' Association of Ontario, RNAO. Adult Asthma Care Guidelines for Nurses: Promoting Control of Asthma Toronto2004 [updated February 2007]. Available from: <u>http://rnao.ca/sites/rnao-ca/files/Adult_Asthma_Care_Guidelines_for_Nurses</u> <u>Promoting_Control_of_Asthma.pdf</u> .
568 569 570	53. Registered Nurses' Association of Ontario, RNAO. Reducing Foot Complications for people with Diabetes Toronto2004 [updated 2007]. Available from: http://rnao.ca/sites/rnao-ca/files/Foot_Compl_Diabetes_Updated.pdf .
571 572 573	54. Acute pain management guideline panel. Acute pain management: Operative or medical procedures and trauma: Clinical practice guideline. Washington DC: US Department of Health and Human Services., 1992.
574 575 576 577	55. Vermeulen H, Storm-Versloot MN, Goossens A, Speelman P, Legemate DA. Diagnostic accuracy of routine postoperative body temperature measurements. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America. 2005 May 15;40(10):1404-10. Epub 2005/04/22. eng.
578 579	56. National Osteoporosis Society. Guidance on the prevention and management of corticosteroid induced osteoporosis. Bath: NOS, 1998.
580 581	57. World Health Organization, WHO. guidelines on hand hygiene in health care (advanced draft) a summary. Clean hands are safer hands. Geneva: WHO, 2005.
582 583	58. Norton JA BD, Bollinger RR, et al., . Surgery: basic science and clinical evidence. 2nd ed. New York: Springer-Verlag; 2001.
584 585 586	59. Malouf AJ, Norton CS, Engel AF, Nicholls RJ, Kamm MA. Long-term results of overlapping anterior anal-sphincter repair for obstetric trauma. Lancet. 2000 Jan 22;355(9200):260-5. PubMed PMID: 10675072. Epub 2000/02/16. eng.

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Schell S, Luke D, Schooley M, Elliott M, Herbers S, Mueller N, et al. Public health program 61. capacity for sustainability: a new framework. Implementation Science. 2013;8(1):15.

62. Hopewell S, Loudon K, Clarke MJ, Oxman AD, Dickersin K. Publication bias in clinical trials due to statistical significance or direction of trial results. The Cochrane database of systematic reviews. 2009 (1):MR000006. Epub 2009/01/23. eng.

63. Easterbrook PJ, Berlin JA, Gopalan R, Matthews DR. Publication bias in clinical research. Lancet. 1991 Apr 13;337(8746):867-72. Epub 1991/04/13. eng.

64. Tricco AC, Cogo E, Ashoor H, Perrier L, McKibbon KA, Grimshaw JM, et al, Sustainability of knowledge translation interventions in healthcare decision-making: protocol for a scoping review. BMJ open. 2013;3(5). Epub 2013/05/16. eng. 13/00.

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Figure Legends				
Table 1	Characteristics of the studies included			
Table 2	Sustainability of professionals' adherence to clinical practice guidelines			
Table 3	Results of the risk of bias assessment			
Figure 1	PRISMA Flow Diagram			

Supplementary files

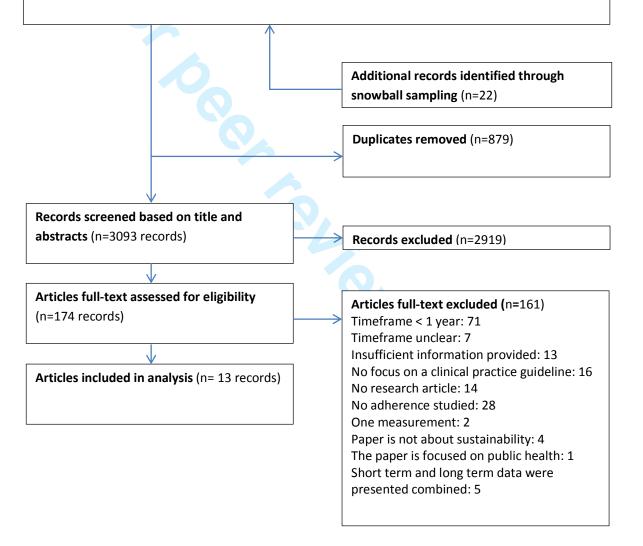
Supplementary file 1	Electronic search strategy for MEDLINE (OvidSP)
Supplementary file 2	Excluded articles based on full-text selection (n=161) (detailed table)
Supplementary file 3	Implementation strategies as described by the authors
Supplementary file 4	Sustainability of professionals' adherence to clinical practice guidelines (detailed table)
Supplementary file 5	Risk of bias using the Downs and Black checklist (detailed table)

Line wang the Downs and Black checklist (detaile

Records identified through electronic database search:

- (1) March 17, 2014 MEDLINE (n=1329), Embase (n=2298), Cochrane (n=81), CINAHL (n=126), GIN (n=0) (n=3830)
- (2) March June 27, 2014: MEDLINE (n=8), Embase (n=99), Cochrane (n=0), CINAHL (n=13), GIN (n=0) (n=120)

(n=3950 records)



1 2 3	Supplementary file 1. Electronic search strategy for MEDLINE (OvidSP)			
4	Database: Ovid MEDLINE <1946 to February Week 4 2014>			
5 6	Date searched: 14.03.2014			
7	Records found: 1329			
8	Sustainability facet			
9 10 11	 (adoption adj2 (longitudinal or long term or longterm)).ti,ab,ot. (64) ((continued or continuation) adj2 (adherence or compliance or effect or effects or effectiveness or impact\$ or intervention\$ or innovation\$ or program\$)).ti,ab,ot. (1823) 			
12	3 (de-adoption adj2 (chang\$ or intervention\$ or innovation\$ or program\$)).ti,ab,ot. (0)			
13 14	 4 (diffusion adj2 (longitudinal or long term or longterm)).ti,ab,ot. (188) 			
15 16	 (diffusion adj2 (longitudinal or long term or long term).it,ab,ot. (188) ((discontinued or discontinuance or discontinuation) adj2 (intervention\$ or innovation\$ or program\$)).it,ab,ot. (202) 			
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23	success\$)).ti,ab,ot. (402) 8 (fidelity adj2 (adherence or adoption or chang\$ or compliance or effect or effects or			
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35 36	effectiveness or fail\$ or intervention\$ or improvement\$ or implement\$ or impact\$ or innovation\$ or long-term or longterm or longitudinal or outcome\$ or "over time" or process\$ or post-			
37 38	implement\$)).ti,ab,ot. (11874)			
39	12 (normali?ation adj2 (adherence or chang\$ or compliance or effect or effects or effectiveness or improvement\$ or impact\$ or innovation\$ or longitudinal or long-term or longterm or outcome\$ or			
40	process\$ or post-implement\$)).ti,ab,ot. (1069)			
41 42 43	13 (persistence adj2 (implement\$ or innovation\$ or program\$ or long-term or longterm or "over time")).ti,ab,ot. (1551)			
44 45 46	14 (routini\$ adj2 (chang\$ or improve\$ or intervention\$ or innovation\$ or longitudinal or long-term or longterm or outcome\$ or "over time" or program\$ or post-implement\$)).ti,ab,ot. (8)			
47 48 49	15 (sustain\$ adj2 (adherence or adoption or assess or benefit\$ or chang\$ or compliance or evaluat\$ or effect or effects or effectiveness or fail\$ or innovation\$ or intervention\$ or improvement\$ or implement\$ or impact\$ or long-term or longterm or outcome\$ or "over time" or			
49 50	program\$ or post-implement\$ or success\$ or vitality)).ti,ab,ot. (15804)			
51	16 sustainability.ti. (1367)			
52	17 or/1-16 (43656)			
53	Guidelines facet			
54 55	18 guideline/ or practice guideline/ (24797)			
55 56				
50 57				
58	20 Guideline Adherence/ (19958)			
59	21 Health Planning Guidelines/ (3791)			
60	22 (guideline\$ or guide-line\$).ti. (45298)			
	23 (practice adj3 parameter\$).ti,ab. (1081)			
	24 clinical protocols/ (19624)			

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- quidance.ti,ab. (53787)
 - care pathway*.ti,ab. (1337)
 - critical pathway/ (4502)
 - (clinical adj3 pathway\$).ti,ab. (2907)
 - algorithms/ (168579)
 - consensus development conference.pt. (8886)
 - consensus development conference nih.pt. (725)
 - or/18-31 (396861)
 - 17 and 32 (1378)

Animal-only study exclusion

- n animals/ and . exp animals/ not (exp animals/ and humans/) (3902375)
- 33 not 34 (1329)

Supplementary file 2. Excluded articles based on full-text selection
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4		
	Paper	Exclusion reason
5	R. Adsit, D. Fraser, L. Redmond, S. Smith, and M. Fiore, 'Changing	No adherence studied
6	Clinical Practice, Helping People Quit: The Wisconsin Cessation Outreach	
7	Model', Wisconsin Medical Journal, 104 (2005), 32-36.	
8		Timofromo , 1 voor
9	B. Allegranzi, A. Gayet-Ageron, N. Damani, L. Bengaly, M. L. McLaws, M.	Timeframe < 1 year
10	L. Moro, Z. Memish, O. Urroz, H. Richet, J. Storr, L. Donaldson, and D.	
11	Pittet, 'Global Implementation of Who's Multimodal Strategy for	
12	Improvement of Hand Hygiene: A Quasi-Experimental Study', The Lancet	
13	J. C. Alonso, 'A Figo Project in Uruguay to Prevent Maternal Death Due to	Insufficient information
14	Unsafe Termination of Pregnancy', Journal of Perinatal Medicine, 41	provided
15	E. Alp, D. Haverkate, and A. Voss, 'Hand Hygiene among Laboratory	Timeframe < 1 year
16		Timename < Tyear
17	Workers', Infection Control & Hospital Epidemiology, 27 (2006), 978-80.	
18	H. K. Amdany, and M. McMillan, 'Metronidazole Intravenous Formulation	Timeframe < 1 year
	Use in in-Patients in Kapkatet District Hospital, Kenya: A Best Practice	
19	Implementation Project', JBI Database of Systematic Reviews and	
20	Implementation Reports, 12 (2014), 419-32.	
21	R. S. Bailie, D. Si, G. W. Robinson, S. J. Togni, and P. H. N. d'Abbs, 'A	Timeframe unclear
22	Multifaceted Health-Service Intervention in Remote Aboriginal	
23	Ğ	
24	Communities: 3-Year Follow-up of the Impact on Diabetes Care', Medical	The former states
25	R. S. Bailie, S. J. Togni, D. Si, G. Robinson, and P. H. N. D'Abbs,	Timeframe unclear
26	Preventive Medical Care in Remote Aboriginal Communities in the	
27	Northern Territory: A Follow-up Study of the Impact of Clinical Guidelines,	
28	Computerised Recall and Reminder Systems, and Audit and Feedback',	
29	Anonymous, 'Report: Cpoe Adoption a Long-Term Process', Healthcare	No research article
30	Benchmarks & Quality Improvement, 10 (2003), 105-7.	
31	M. B. Goetz, T. Hoang, S. R. Henry, H. Knapp, H. D. Anaya, A. L. Gifford,	No focus on a clinical
32		
33	and S. M. Asch, 'Evaluation of the Sustainability of an Intervention to	practice guideline
	Increase Hiv Testing', J Gen Intern Med, 24 (2009), 1275-80.	
34	E. L. Mawdsley, S. Garcia-Houchins, and S. G. Weber, 'Back to Basics:	No focus on a clinical
35	Four Years of Sustained Improvement in Implementation of Contact	practice guideline
36	Precautions at a University Hospital', Joint Commission journal on quality	
37	and patient safety / Joint Commission Resources, 36 (2010), 418-23.	
38	R. S. Bailie, G. Robinson, S. N. Kondalsamy-Chennakesavan, S. Halpin,	Timeframe < 1 year
39	and Z. Wang, 'Investigating the Sustainability of Outcomes in a Chronic	, ,
40	Disease Treatment Programme', Soc Sci Med, 63 (2006), 1661-70.	
41	-	Timofromo < 1 year
42	F. E. Babl, D. Krieser, J. Belousoff, and T. Theophilos, 'Evaluation of a	Timeframe < 1 year
43	Paediatric Procedural Sedation Training and Credentialing Programme:	
44	Sustainability of Change', Emerg Med J, 27 (2010), 577-81.	
45	P. A. Bampton, J. J. Sandford, and G. P. Young, 'Achieving Long-Term	Timeframe < 1 year
46	Compliance with Colonoscopic Surveillance Guidelines for Patients at	
47	Increased Risk of Colorectal Cancer in Australia', International Journal of	
48	Clinical Practice, 61 (2007), 510-13.	
49	D. Berild, T. G. Abrahamsen, S. Andresen, E. Bjorlow, O. Haug, I. M.	Timeframe < 1 year
5 0		Timename < Tyear
51	Kossenko, O. I. Kubar, M. Lelek, S. I. Mintchenko, M. F. Pyasetskaya, S.	
	H. Ringertz, and G. A. Sysenko, 'A Controlled Intervention Study to	
52	Improve Antibiotic Use in a Russian Paediatric Hospital', International	
53	Journal of Antimicrobial Agents, 31 (2008), 478-83.	
54	M. T. Bigham, R. Amato, P. Bondurrant, J. Fridriksson, C. D. Krawczeski,	Short term and long term
55	J. Raake, S. Ryckman, S. Schwartz, J. Shaw, D. Wells, and R. J. Brilli,	data were presented
56	Ventilator-Associated Pneumonia in the Pediatric Intensive Care Unit:	
57		combined
58	Characterizing the Problem and Implementing a Sustainable Solution',	
59	M. Fleuren, E. Dusseldorp, S. van den Bergh, H. Vlek, J. Wildschut, E. van	
60		practice guideline
	Back Pain: Effect on Unnecessary Referrals', Int J Qual Health Care, 22	

Enseignement Superieur (ABES) . Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies.

BMJ Open

1 2 3 4	K. Blanchet, and P. James, 'Can International Health Programmes Be Sustained after the End of International Funding: The Case of Eye Care Interventions in Ghana', BMC Health Serv Res, 14 (2014), 77.	No focus on a clinical practice guideline
5 6 7	P. G. Teixeira, K. Inaba, J. Dubose, N. Melo, M. Bass, H. Belzberg, and D. Demetriades, 'Measurable Outcomes of Quality Improvement Using a Daily Quality Rounds Checklist: Two-Year Prospective Analysis of	No focus on a clinical practice guideline
8 9 10 11	Sustainability in a Surgical Intensive Care Unit', The Journal of Trauma L. Bowers, C. Berry-Caban, and R. Munson, 'Implementing Process Improvement Efforts to Increase Adherence with Diabetes Clinical Practice Guidelines in a Military Treatment Facility', Journal of the American	Insufficient information provided
12 13	C. C. Bowman, E. J. Sobo, S. M. Asch, and A. L. Gifford, 'Measuring Persistence of Implementation: Queri Series', Implement Sci, 3 (2008), 21.	No research article
14 15 16	C. Brand, F. Landgren, A. Hutchinson, C. Jones, L. MacGregor, and D. Campbell, 'Clinical Practice Guidelines: Barriers to Durability after Effective Early Implementation', Internal Medicine Journal, 35 (2005), 162-69.	One measurement
17 18 19	B. D. Brazzell, 'Improving High Hand-Hygiene Compliance and Reducing Healthcareassociated Infection in Eight Nursing Units', American Journal	Timeframe < 1 year
20 21 22	of Infection Control, 1) (2014), S25-S26. A. S. Brent, W. M. Rahman, L. L. Knarr, J. A. Harrison, K. L. Kearns, and D. S. Lindstrom, 'Reducing Cycle Times in Pediatric Emergency Medicine',	No adherence studied
23 24 25	Pediatric Emergency Care, 25 (2009), 307-11. D. L. Whitford, S. H. Roberts, and S. Griffin, 'Sustainability and	Timeframe unclear
26 27	Effectiveness of Comprehensive Diabetes Care to a District Population', B. L. Carter, 'Blood Pressure Control-Implementing a Team Approach', US Cardiology, 8 (2011), 108-13.	No research article
28 29 30 31	Ali A. Cheema, Annette M. Scott, Karen J. Shambaugh, Jacqueline N. Shaffer-Hartman, Ronald E. Dechert, Susan M. Hieber, John W. Gosbee, and Matthew F. Niedner, 'Rebound in Ventilator-Associated Pneumonia	Short term and long term data were presented combined
32 33 34	Rates During a Prevention Checklist Washout Period', BMJ Quality & Y. C. Chen, W. H. Sheng, J. T. Wang, S. C. Chang, H. C. Lin, K. L. Tien, L. Y. Hsu, and K. S. Tsai, 'Effectiveness and Limitations of Hand Hygiene Promotion on Decreasing Healthcare-Associated Infections', PLoS ONE	Timeframe < 1 year
35 36 37	L. L. Chlan, J. L. Guttormson, and K. Savik, 'Tailoring a Treatment Fidelity Framework for an Intensive Care Unit Clinical Trial', Nursing Research, 60	Timeframe < 1 year
38 39	B. Crawford, M. Skeath, and A. Whippy, 'Kaiser Permanente Northern California Sepsis Mortality Reduction Initiative', Critical Care, 16 (2012).	Timeframe < 1 year
40 41 42	J. D. Crews, E. Whaley, D. Syblik, and J. Starke, 'Sustained Improvement in Hand Hygiene at a Children's Hospital', Infection Control and Hospital Epidemiology, 34 (2013), 751-53.	Timeframe < 1 year
43 44 45	S. B. DeMauro, E. Douglas, K. Karp, B. Schmidt, J. Patel, A. Kronberger, R. Scarboro, and M. Posencheg, 'Improving Delivery Room Management for Very Preterm Infants', Pediatrics, 132 (2013), e1018-e25.	Short term and long term data were presented combined
46 47 48	S. Deuster, I. Roten, and S. Muehlebach, 'Implementation of Treatment Guidelines to Support Judicious Use of Antibiotic Therapy', Journal of Clinical Pharmacy and Therapeutics, 35 (2010), 71-78.	Timeframe < 1 year
49 50 51	M. A. Doyle, S. Brez, S. Sicoli, F. De Sousa, E. Keely, and J. C. Malcom, 'Using Standardized Insulin Orders to Improve Patient Safety in a Tertiary	Insufficient information provided
52 53 54 55 56	Care Centre', Canadian Journal of Diabetes, 38 (2014), 118-25. K. Ellingson, R. R. Muder, R. Jain, D. Kleinbaum, P. J. Feng, C. Cunningham, C. Squier, J. Lloyd, J. Edwards, V. Gebski, and J. Jernigan, 'Sustained Reduction in the Clinical Incidence of Methicillin-Resistant Staphylococcus Aureus Colonization or Infection Associated with a	No adherence studied
57 58 59 60	Multifaceted Infection Control Intervention', Infect Control Hosp Epidemiol, J. N. Epstein, J. M. Langberg, P. K. Lichtenstein, R. C. Kolb, and L. J. Stark, 'Sustained Improvement in Pediatricians' Adhd Practice Behaviors in the Context of a Community-Based Quality Improvement Initiative',	Timeframe < 1 year
	K. J. Evans, J. Thompson, S. E. Spratt, L. F. Lien, and A. Vorderstrasse, 'The Implementation and Evaluation of an Evidence-Based Protocol to Treat Diabetic Ketoacidosis: A Quality Improvement Study', Adv Emerg	Timeframe < 1 year

1 2 3 4	M. Fakhry, G. B. Hanna, O. Anderson, A. Holmes, and D. Nathwani, 'Effectiveness of an Audible Reminder on Hand Hygiene Adherence', American Journal of Infection Control, 40 (2012), 320-23.	Timeframe < 1 year
5 6 7 8	M. G. Fakih, K. Jones, J. E. Rey, R. Takla, S. Szpunar, K. Brown, A. Boelstler, and L. Saravolatz, 'Peripheral Venous Catheter Care in the Emergency Department: Education and Feedback Lead to Marked Improvements', American Journal of Infection Control, 41 (2013), 531-6.	Timeframe < 1 year
9 10 11	M. Bunik, M. J. Federico, B. Beaty, M. Rannie, J. T. Olin, and A. Kempe, 'Quality Improvement for Asthma Care within a Hospital-Based Teaching Clinic', Academic Pediatrics, 11 (2011), 58-65.	Timeframe < 1 year
12 13 14	B. R. Ferrell, and R. Virani, 'Institutional Commitment to Improved Pain Management: Sustaining the Effort', Journal of Pharmaceutical Care in Pain and Symptom Control, 6 (1998), 43-55.	No adherence studied
15 16 17 18 19	G. T. Feyissa, J. S. Gomersall, and S. Robertson-Malt, 'Compliance to Hand Hygiene Practice among Nurses in Jimma University Specialized Hospital in Ethiopia: A Best Practice Implementation Project', JBI Database of Systematic Reviews and Implementation Reports, 12 (2014),	Timeframe < 1 year
20 21 22	A. M. Finucane, B. Stevenson, R. Moyes, D. Oxenham, and S. A. Murray, 'Improving End-of-Life Care in Nursing Homes: Implementation and Evaluation of an Intervention to Sustain Quality of Care', Palliative	Timeframe < 1 year
23 24	A. Fisher, 'How Nhs Trusts Are Tackling Healthcare-Associated Infections', Nursing management (Harrow, London, England : 1994), 16	No research article
25 26 27	E. J. Gallagher, and S. W. Trotzky, 'Sustained Effect of an Intervention to Limit Ordering of Emergency Department Lumbosacral Spine Films', Journal of Emergency Medicine, 16 (1998), 395-401.	No focus on a clinical practice guideline
28 29 30 31 32	G. C. Fonarow, M. J. Reeves, E. E. Smith, J. L. Saver, X. Zhao, D. W. Olson, A. F. Hernandez, E. D. Peterson, L. H. Schwamm, G. WTG-Stroke Steering Committee, and Investigators, 'Characteristics, Performance Measures, and in-Hospital Outcomes of the First One Million Stroke and Transient Ischemic Attack Admissions in Get with the Guidelines-Stroke',	No focus on a clinical practice guideline
33 34 35 36	D. Fonda, J. Cook, V. Sandler, and M. Bailey, 'Sustained Reduction in Serious Fall-Related Injuries in Older People in Hospital', Medical Journal of Australia, 184 (2006), 379-82.	No focus on a clinical practice guideline
37 38 39	S. P. Ford, M. K. Leick-Rude, K. A. Meinert, B. Anderson, M. B. Sheehan, B. M. Haney, S. R. Leeks, S. D. Simon, and J. K. Jackson, 'Overcoming Barriers to Oxygen Saturation Targeting', Pediatrics, 118 Suppl 2 (2006),	No adherence studied
40 41 42	J. Fortney, M. Enderle, S. McDougall, J. Clothier, J. Otero, L. Altman, and G. Curran, 'Implementation Outcomes of Evidence-Based Quality Improvement for Depression in Va Community Based Outpatient Clinics',	Timeframe < 1 year
43 44 45 46	J. B. Froehlich, D. Karavite, P. L. Russman, N. Erdem, C. Wise, G. Zelenock, T. Wakefield, J. Stanley, K. A. Eagle, Cardiology American College of, and Association American Heart, 'American College of Cardiology/American Heart Association Preoperative Assessment	No adherence studied
47 48	Guidelines Reduce Resource Utilization before Aortic Surgery', Journal of L. Y. Fu, M. Weissman, R. McLaren, C. Thomas, J. Campbell, J. Mbafor,	Timeframe < 1 year
49 50	U. Doshi, and D. Cora-Bramble, 'Improving the Quality of Immunization Delivery to an at-Risk Population: A Comprehensive Approach', Pediatrics,	
51 52 53 54 55 56	C. Fuller, S. Michie, J. Savage, J. McAteer, S. Besser, A. Charlett, A. Hayward, B. D. Cookson, B. S. Cooper, G. Duckworth, A. Jeanes, J. Roberts, L. Teare, and S. Stone, 'The Feedback Intervention Trial (Fit) - Improving Hand-Hygiene Compliance in Uk Healthcare Workers: A Stepped Wedge Cluster Randomised Controlled Trial', PLoS ONE, 7	Timeframe < 1 year
57 58 59	P. W. Lee, A. J. Dietrich, T. E. Oxman, J. W. Williams, Jr., and S. L. Barry, 'Sustainable Impact of a Primary Care Depression Intervention', J Am Board Fam Med, 20 (2007), 427-33.	practice guideline
60	V. Ganju, 'Mental Health Quality and Accountability: The Role of Evidence- Based Practices and Performance Measurement', Administration & Policy in Mental Health, 33 (2006), 659-65.	No research article

1		
1 2	M. Gazarian, and L. V. Graudins, 'Long-Term Reduction in Adverse Drug	Timeframe < 1 year
3	Events: An Evidence-Based Improvement Model', Pediatrics, 129 (2012),	
4	K. M. Gendron, S. Y. Lai, G. S. Weinstein, A. A. Chalian, J. M. Husbands,	No adherence studied
5	P. F. Wolf, L. DiDonato, and R. S. Weber, 'Clinical Care Pathway for Head	
6	and Neck Cancer: A Valuable Tool for Decreasing Resource Utilization',	
7	Archives of Otolaryngology - Head and Neck Surgery, 128 (2002), 258-62.	
8	M. F. Gerdtz, R. Waite, T. Vassiliou, B. Garbutt, R. Prematunga, and E.	Timeframe < 1 year
9	Virtue, 'Evaluation of a Multifaceted Intervention on Documentation of Vital	-
10	Signs at Triage: A before-and-after Study', EMA - Emergency Medicine	
11	V. Gibbons, T. Esselink, and S. McHugh, 'Assessing Practice Relating to	Insufficient information
12	Fall Risk Management among Nurses in an Acute Ward Setting: A Best	provided
13 14	Practice Implementation Report', JBI Database of Systematic Reviews and	
14	Implementation Reports, 11 (2013), 275-85.	
16		Timeframe < 1 year
17	Weijden, and M. F. Von Meyenfeldt, 'Sustainability of an Enhanced	
18	Recovery Programme in Colonic Surgery in the Netherlands', European	
19	Edward M. Glaser, 'Durability of Innovations in Human Service	No focus on a clinical
20		
21	S. G. Anthony, L. M. Prevedello, M. M. Damiano, T. K. Gandhi, P. M.	Timeframe < 1 year
22	Doubilet, S. E. Seltzer, and R. Khorasani, 'Impact of a 4-Year Quality	
23	Improvement Initiative to Improve Communication of Critical Imaging Test	No Barrison of Paul
24 25	L. Gonzalez, J. F. Elgart, H. Calvo, and J. J. Gagliardino, 'Changes in	No adherence studied
25 26	Quality of Care and Costs Induced by Implementation of a Diabetes	
27	Program in a Social Security Entity of Argentina', ClinicoEconomics and M. L. Grayson, P. L. Russo, M. Cruickshank, J. L. Bear, C. A. Gee, C. F.	Timeframe < 1 year
28	Hughes, P. D. R. Johnson, R. McCann, A. J. McMillan, B. G. Mitchell, C.	rimeirame < 1 year
29	E. Selvey, R. E. Smith, and I. J. Wilkinson, 'Outcomes from the First 2	
30	Years of the Australian National Hand Hygiene Initiative', Medical Journal	
31	T. Greenhalgh, F. Macfarlane, C. Barton-Sweeney, and F. Woodard, "If	No adherence studied
32	We Build It, Will It Stay?" A Case Study of the Sustainability of Whole-	
33	System Change in London', Milbank Q, 90 (2012), 516-47.	
34	R. Grol, J. Braspenning, R. Dijkstra, M. Hulscher, and M. Wensing,	No research article
35 26	'Implementation of Nhg Guidelines: Success or Problem?. [Dutch]	
36 37	Terry J. Hannan, Stanley Bart, Colin Sharp, Mathew J. Fassett, and Robert	No focus on a clinical
38	G. Fassett, 'The Sustainability of Medical Morning Handover Reporting:	practice guideline
39	Adherence in a Regional Hospital', Australian Health Review, 34 (2010),	
40	M. F. Harris, C. Hobbs, G. P. Davies, S. Simpson, D. Bernard, and A.	Timeframe < 1 year
41	Stubbs, 'Implementation of a Snap Intervention in Two Divisions of	
42	General Practice: A Feasibility Study', Medical Journal of Australia, 183 🥖	
43	J. S. Haukoos, E. Hopkins, V. T. Eliopoulos, R. L. Byyny, K. A. Laperriere,	No adherence studied
44	M. X. Mendoza, M. W. Thrun, and H. I. V. Testing Study Group Denver	
45 46	Emergency Department Rapid, 'Development and Implementation of a	
40 47	Model to Improve Identification of Patients Infected with Hiv Using	
48	Diagnostic Rapid Testing in the Emergency Department', Academic	Timeframe i diver
49	D. Henry, F. R. Muriel, and P. Hirway, 'Sustaining Improvement in Surgical	nmerrame < 1 year
50	Infection Prevention Measures for Hysterectomy', Journal for healthcare quality : official publication of the National Association for Healthcare	
51	Kathryn Smith Higuchi, Angela Downey, Barbara Davies, Irmajean Bajnok,	No adherence studied
52	and Melissa Waggott, 'Using the Nhs Sustainability Framework to	No auterence studied
53	Understand the Activities and Resource Implications of Canadian Nursing	
54	Guideline Early Adopters', Journal of Clinical Nursing, 22 (2013), 1707-16.	
55 56	P. B. Howard, P. El-Mallakh, A. L. Miller, M. K. Rayens, G. R. Bond, K.	Paper is not about
56 57	Henderson, and A. T. Cooley, 'Prescriber Fidelity to a Medication	sustainability
58	Management Evidence-Based Practice in the Treatment of Schizophrenia',	
59	P. Hudson, and A. Kupa, 'Anaphylaxis Discharge Management "Reducing	Insufficient information
60	the Risk"', Internal Medicine Journal, 40 (2010), 12.	provided
	——, 'Optimising Anaphylaxis Discharge Management', Allergy:	Insufficient information
	European Journal of Allergy and Clinical Immunology, 65 (2010), 44.	provided

1		
2	A. Jamal, G. O'Grady, E. Harnett, D. Dalton, and D. Andresen, 'Improving	Timeframe < 1 year
3	Hand Hygiene in a Paediatric Hospital: A Multimodal Quality Improvement	-
4	Approach', BMJ Quality & Safety, 21 (2012), 171-76.	
5	K. Johnson, and A. Grossman, 'Implementation and Maintenance of	Insufficient information
6	Practice Guidelines to Decrease Central Line Associated Bloodstream	provided
7	Infections by Minimizing Line Manipulation', Biology of Blood and Marrow	provided
8		No odboropoo studiod
9	R. Johnstone, A. Jones, and A. Fowell, 'Welsh Collaborative Care	No adherence studied
10	Pathway Project; 10 Years Experience of Implementing and Maintaining a	
10	Care Pathway for the Last Days of Life', International Journal of Care	
12	L. C. Kahwati, T. X. Lance, K. R. Jones, and L. S. Kinsinger, 'Re-Aim	Paper is not about
13	Evaluation of the Veterans Health Administration's Move! Weight	sustainability
13 14	Management Program', Translational Behavioral Medicine, 1 (2011), 551-	
14	T. G. Kampmeier, R. P. Lukas, C. Steffler, C. Sauerland, T. P. Weber, H.	Timeframe < 1 year
	Van Aken, and A. Bohn, 'Chest Compression Depth after Change in Cpr	-
16	Guidelines-Improved but Not Sufficient', Resuscitation, 85 (2014), 503-08.	
17	L. S. Kao, D. F. Lew, P. D. Doyle, M. M. Carrick, V. S. Jordan, E. J.	Timeframe < 1 year
18	Thomas, and K. P. Lally, 'A Tale of 2 Hospitals: A Staggered Cohort Study	rinonanio (r yoar
19	of Targeted Interventions to Improve Compliance with Antibiotic	
20	-	
21	Prophylaxis Guidelines', Surgery, 148 (2010), 255-62.	
22	S. M. Kellie, A. Timmins, and C. Brown, 'A Statewide Collaborative to	No adherence studied
23	Reduce Methicillin-Resistant Staphylococcus Aureus Bacteremias in New	
24	Mexico', Joint Commission journal on quality and patient safety / Joint	
25	D. J. Kenny, and P. Goodman, 'Care of the Patient with Enteral Tube	Timeframe < 1 year
26	Feeding: An Evidence-Based Practice Protocol', Nursing Research, 59	
27	J. King, and J. A. Gold, 'Sustaining Improvements in Quality', Wisconsin	No research article
28	Medical Journal, 113 (2014), 37.	
29	R. Knippenberg, A. Soucat, K. Oyegbite, M. Sene, D. Broun, K. Pangu, I.	No research article
30	Hopwood, R. Grandcourt, K. L. Tinguiri, I. Fall, S. Ammassari, and E.	
31	Alihonou, 'Sustainability of Primary Health Care Including Expanded	
32	Program of Immunizations in Bamako Initiative Programs in West Africa:	
33	An Assessment of 5 Years' Field Experience in Benin and Guinea',	
34	J. D. Knudsen, and S. E. Andersen, 'A Multidisciplinary Intervention to	Timeframe < 1 year
35		
36	Reduce Infections of Esbl- and Ampc-Producing, Gram-Negative Bacteria	
37	at a University Hospital', PLoS ONE, 9 (2014).	
38	B. S. Kodali, D. Kim, R. Bleday, H. Flanagan, and R. D. Urman,	No focus on a clinical
39	Successful Strategies for the Reduction of Operating Room Turnover	practice guideline
40	Times in a Tertiary Care Academic Medical Center', Journal of Surgical	
41	D. J. Kolko, A. M. Iselin, and K. J. Gully, 'Evaluation of the Sustainability	One measurement
42	and Clinical Outcome of Alternatives for Families: A Cognitive-Behavioral	
43	Therapy (Af-Cbt) in a Child Protection Center', Child Abuse Negl, 35	
44	R. Kramer, R. Groom, D. Weldner, P. Gallant, B. Heyl, R. Knapp, and A.	No adherence studied
45	Arnold, 'Glycemic Control and Reduction of Deep Sternal Wound Infection	
46	Rates: A Multidisciplinary Approach', Archives of Surgery, 143 (2008), 451-	
47	J. Lagan, P. Garg, J. M. Tang, and M. Burgess, 'Oxygen Therapy in	Timeframe unclear
48	Patients with Chest Pain of Acute Onset: Single Centre Audit Experience',	
49	British Journal of Hospital Medicine, 74 (2013), 347-9.	
50		Timesfromes 4
51	B. Lai, C. Gibb, J. Pink, and L. Thomas, 'Sustainability of a Pharmacist-	Timeframe < 1 year
52	Driven Pathway for Osteoporosis-Related Fractures on an Orthopaedic	
53	Unit after a 5-Year Period', International Journal of Pharmacy Practice, 20	
54	B. C. C. Lam, J. Lee, and Y. L. Lau, 'Hand Hygiene Practices in a	Timeframe < 1 year
55	Neonatal Intensive Care Unit: A Multimodal Intervention and Impact on	
56	Nosocomial Infection', Pediatrics, 114 (2004), e565-71.	
57	S. M. Levy, C. E. Senter, R. B. Hawkins, J. Y. Zhao, K. Doody, L. S. Kao,	Paper is not about
58	K. P. Lally, and K. Tsao, 'Implementing a Surgical Checklist: More Than	sustainability
59		
	Checking a Box', Surgery, 152 (2012). 331-6.	
	Checking a Box', Surgery, 152 (2012), 331-6. S. L. Lim, S. C. Ng, J. Lve, W. C. Loke, M. Ferguson, and L. Daniels,	Timeframe < 1 vear
60	S. L. Lim, S. C. Ng, J. Lye, W. C. Loke, M. Ferguson, and L. Daniels,	Timeframe < 1 year
		Timeframe < 1 year

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1		
2	N. Lubisch, R. Roskos, and S. M. Sattler, 'Improving Outcomes in	Insufficient information
3	Pediatric Procedural Sedation', Joint Commission Journal on Quality &	provided
4	S. Mace, and D. Taylor, 'Improving Adherence to Nice Guidance for	Timeframe < 1 year
5	Bipolar Illness: Valproate Use in Women of Childbearing Potential',	, ,
6		Timeframe < 1 year
7	Dodek, 'Introduction of a Comprehensive Management Protocol for	,
8	Severe Sepsis Is Associated with Sustained Improvements in Timeliness	
9	of Care and Survival', Quality & Safety in Health Care, 19 (2010), e46.	
10	A. Maher, 'A Multi-Faceted Approach to Reducing Risk of Bloodstream	Timeframe < 1 year
11	Infections for Pediatric Rehabilitation Patients Receiving Total Parenteral	
12	Nutrition', American Journal of Infection Control, 37 (5) (2009), E37-E38.	
13		No adherence studied
14	Sustainability in Challenging Health-Care Contexts: Embedding Clinically	
15	Led Change in Routine Practice', Health Serv Manage Res, 25 (2012), 190-	
16	B. C. Marshall, and E. C. Nelson, 'Accelerating Implementation of	No research article
17	Biomedical Research Advances: Critical Elements of a Successful 10 Year	
18	Cystic Fibrosis Foundation Healthcare Delivery Improvement Initiative',	
19		No adherence studied
20 21	and Louis D. Saravolatz, 'Sustained Reductions in Urinary Catheter Use	
21	over 5 Years: Bedside Nurses View Themselves Responsible for	
23	Evaluation of Catheter Necessity', American Journal of Infection Control,	
24	J. Mayer, B. Mooney, A. Gundlapalli, S. Harbarth, G. J. Stoddard, M. A.	Timeframe < 1 year
25	Rubin, L. Eutropius, B. Brinton, and M. H. Samore, 'Dissemination and	
26	Sustainability of a Hospital-Wide Hand Hygiene Program Emphasizing	
27	Positive Reinforcement', Infection Control & Hospital Epidemiology, 32	
28	W. M. McClellan, D. L. Frankenfield, P. R. Frederick, W. D. Flanders, A.	Timeframe < 1 year
29	Alfaro- Correa, M. Rocco, and S. D. Helgerson, 'Can Dialysis Therapy Be	Timename < Tyear
30	Improved? A Report from the Esrd Core Indicators Project', American	
31	R. McDermott, F. Tulip, B. Schmidt, and A. Sinha, 'Sustaining Better	No adherence studied
32		NO aunerence studied
33	Diabetes Care in Remote Indigenous Australian Communities', British Medical Journal, 327 (2003), 428-30.	
34	C. McDonnell, 'Interventions Guided by Analysis of Quality Indicators	Timeframe < 1 year
35		Timename < Tyear
36	Decrease the Frequency of Laryngospasm During Pediatric Anesthesia',	
37	Paediatric Anaesthesia, 23 (2013), 579-87.	Incufficient information
38	M. McDonnell, C. Reynolds, E. Nic Dhonncha, A. O'Connell, M. O'Donnell,	
39	and T. Walsh, 'Audit of Acute Stroke Care: From the Emergency	provided
40	Department to the Acute Stroke Unit', Irish Journal of Medical Science,	Departie net about
41	G. J. McHugo, R. E. Drake, R. Whitley, G. R. Bond, K. Campbell, C. A.	Paper is not about
42 43	Rapp, H. H. Goldman, W. J. Lutz, and M. T. Finnerty, 'Fidelity Outcomes in	sustainability
43 44	the National Implementing Evidence-Based Practices Project', Psychiatric	
44	Services, 58 (2007), 1279-84.	Timefrome . A year
46	Christine McMullan, Grace Propper, Christine Schuhmacher, Lisa	Timeframe < 1 year
40	Sokoloff, David Harris, Paul Murphy, and William H. Greene, 'A	
48	Multidisciplinary Approach to Reduce Central Line-Associated	
49	Bloodstream Infections', Joint Commission Journal on Quality & Patient	Nie weeren entiele
50	K. Meier, 'Sustainability in Health Care - Changing Mind, Knowledge and	No research article
51	Behaviour', European Journal of Oncology Pharmacy, 6 (2012), 3.	T
52	M. J. Mello, J. Bromberg, J. Baird, T. Nirenberg, T. Chun, C. Lee, and J.	Timeframe < 1 year
53	G. Linakis, 'Translation of Alcohol Screening and Brief Intervention	
54	Guidelines to Pediatric Trauma Centers', Journal of Trauma and Acute	.
55	J. Melnikow, N. D. Kohatsu, and B. K. S. Chan, 'Put Prevention into	Timeframe < 1 year
56	Practice: A Controlled Evaluation', American Journal of Public Health, 90	Therefore t
57	W. C. Mertens, D. J. Higby, D. Brown, R. Parisi, J. Fitzgerald, E. M.	Timeframe < 1 year
58	Benjamin, and P. K. Lindenauer, 'Improving the Care of Patients with	
59	Regard to Chemotherapy-Induced Nausea and Emesis: The Effect of	
60	Feedback to Clinicians on Adherence to Antiemetic Prescribing	

1 A. Mian, C. Russell, M. Honeycutt, and C. Oldridge, 'Multidisciplinary Insufficient information 2 Approach to Reduction of Central Line Associated Blood Stream Infections provided 3 4 (Clabsi): An Institutional Experience with Collaborative Guidelines', The 5 Journal of the Arkansas Medical Society, 109 (2012), 128-31. 6 M. R. Miller, M. Griswold, J. M. Harris, II, G. Yenokyan, W. C. Huskins, M. Timeframe < 1 year 7 Moss, T. B. Rice, D. Ridling, D. Campbell, P. Margolis, S. Muething, and 8 R. J. Brilli, 'Decreasing Picu Catheter-Associated Bloodstream Infections: 9 Nachri's Quality Transformation Efforts.... National Association of 10 Children's Hospitals and Related Institutions', Pediatrics, 125 (2010), 206-11 M. R. Miller, M. F. Niedner, W. C. Huskins, E. Colantuoni, G. Yenokyan, Timeframe < 1 year 12 M. Moss, T. B. Rice, D. Ridling, D. Campbell, and R. J. Brilli, 'Reducing 13 Picu Central Line - Associated Bloodstream Infections: 3-Year Results'. 14 L. S. Segre, M. W. O'Hara, R. L. Brock, and D. Taylor, 'Depression The paper is focused on 15 Screening of Perinatal Women by the Des Moines Healthy Start Project: public health 16 Program Description and Evaluation', Psychiatric Services, 63 (2012), 250-17 D. M. Nestler, A. Noheria, L. H. Haro, L. G. Stead, W. W. Decker, L. N. No adherence studied 18 Scanlan-Hanson, R. J. Lennon, C. C. Lim, D. R. Holmes, C. S. Rihal, M. 19 R. Bell, and H. H. Ting, 'Sustaining Improvement in Door-to-Balloon Time 20 over 4 Years: The Mayo Clinic St-Elevation Myocardial Infarction Protocol', 21 22 Circulation: Cardiovascular Quality and Outcomes, 2 (2009), 508-13. 23 G. T. O'Connor, S. K. Plume, E. M. Olmstead, J. R. Morton, C. T. No focus on a clinical 24 Maloney, W. C. Nugent, F. Hernandez, Jr., R. Clough, B. J. Leavitt, L. H. practice guideline 25 Coffin, C. A. Marrin, D. Wennberg, J. D. Birkmeyer, D. C. Charlesworth, D. 26 J. Malenka, H. B. Quinton, and J. F. Kasper, 'A Regional Intervention to 27 Improve the Hospital Mortality Associated with Coronary Artery Bypass 28 Graft Surgery. The Northern New England Cardiovascular Disease Study 29 B. Ostrowsky, S. Sharma, M. Defino, Y. Guo, P. Shah, S. McAllen, P. Timeframe < 1 year 30 Chung, S. Brown, J. Paternoster, A. Schechter, B. Yongue, and R. Bhalla, 31 'Antimicrobial Stewardship and Automated Pharmacy Technology Improve 32 Antibiotic Appropriateness for Community-Acquired Pneumonia', Infection 33 Control and Hospital Epidemiology, 34 (2013), 566-72. 34 E. Pawlowski, and D. Hobbs, 'A Large Community Hospital's Multi-Insufficient information 35 Disciplinary Approach to Code Stroke', Stroke, 44 (12) (2013), e203. provided 36 P. H. Perlstein, U. R. Kotagal, P. J. Schoettker, H. D. Atherton, M. K. Timeframe < 1 year 37 Farrell, W. E. Gerhardt, and M. P. Alfaro, 'Sustaining the Implementation 38 of an Evidence-Based Guideline for Bronchiolitis', in Archives of Pediatrics 39 40 & Adolescent Medicine (2000), pp. 1001-07. 41 D. Petroudi, 'Nosocomial Infections and Staff Hygiene', Journal of Infection No research article 42 in Developing Countries, 3 (2009), 152-56. 43 J. A. Al-Tawfiq, M. S. Abed, N. Al-Yami, and R. B. Birrer, 'Promoting and Timeframe < 1 year 44 Sustaining a Hospital-Wide, Multifaceted Hand Hygiene Program Resulted 45 in Significant Reduction in Health Care-Associated Infections', American 46 Journal of Infection Control, 41 (2013), 482-6. 47 A. J. Porter, J. Y. Narimasu, M. F. Mulroy, and R. P. Koehler, 'Sustainable, Timeframe < 1 year 48 Effective Implementation of a Surgical Preprocedural Checklist: An 49 "Attestation" Format for All Operating Team Members', Joint Commission 50 journal on quality and patient safety / Joint Commission Resources, 40 51 P. J. Pronovost, C. A. Goeschel, E. Colantuoni, S. Watson, L. H. No adherence studied 52 Lubomski, S. M. Berenholtz, D. A. Thompson, D. J. Sinopoli, S. Cosgrove, 53 J. B. Sexton, J. A. Marsteller, R. C. Hyzy, R. Welsh, P. Posa, K. 54 Schumacher, and D. Needham, 'Sustaining Reductions in Catheter 55 Related Bloodstream Infections in Michigan Intensive Care Units: 56 S. Provost, R. Pineault, P. Tousignant, M. Hamel, and R. B. Da Silva, No research article 57 'Evaluation of the Implementation of an Integrated Primary Care Network 58 59 for Prevention and Management of Cardiometabolic Risk in Montreal', 60 B. R. Rachman, and R. B. Mink, 'A Prospective Observational Quality No adherence studied Improvement Study of the Sustained Effects of a Program to Reduce Unplanned Extubations in a Pediatric Intensive Care Unit', Paediatric

Enseignement Superieur (ABES) . Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies.

BMJ Open

1 2 3 4	H. Ragazzi, A. Keller, R. Ehrensberger, and A. M. Irani, 'Evaluation of a Practice-Based Intervention to Improve the Management of Pediatric Asthma', Journal of urban health : bulletin of the New York Academy of	Timeframe < 1 year
5 6	C. A. Rapp, R. J. Goscha, and L. S. Carlson, 'Evidence-Based Practice Implementation in Kansas', Community mental health journal, 46 (2010),	No adherence studied
7 8 9	A. Rawn, and K. Wilson, 'Standardized Network Order Sets in Rural Ontario: A Follow-up Report on Successes and Sustainability', Healthcare quarterly (Toronto, Ont.), 14 (2011), 95-100.	No research article
10 11 12 13	G. Regev-Yochay, M. Raz, R. Dagan, H. Roizin, B. Morag, S. Hetman, S. Ringel, N. Ben-Israel, M. Varon, E. Somekh, and E. Rubinstein, 'Reduction in Antibiotic Use Following a Cluster Randomized Controlled Multifaceted Intervention: The Israeli Judicious Antibiotic Prescription Study', Clinical	Timeframe < 1 year
14 15 16 17	S. Reid, and J. McFarlin, 'Environmental Hygiene Sustainability-Is It Possible?', American Journal of Infection Control, 40 (5) (2012), e68-e69. M. J. Richards, M. B. Robertson, J. G. A. Dartnell, M. M. Duarte, N. R.	Insufficient information provided No focus on a clinical
18 19 20	Jones, D. A. Kerr, L. L. Lim, P. D. Ritchie, G. J. Stanton, and S. E. Taylor, 'Impact of a Web-Based Antimicrobial Approval System on Broad- Spectrum Cephalosporin Use at a Teaching Hospital', Medical Journal of	practice guideline
21 22 23 24	S. A. Roberts, C. Sieczkowski, T. Campbell, G. Balla, A. Keenan, Steering Auckland District Health Board Hand Hygiene, and Groups Working, 'Implementing and Sustaining a Hand Hygiene Culture Change	Timeframe < 1 year
24 25 26	Programme at Auckland District Health Board', New Zealand Medical M. T. Roe, 'Success Stories: How Hospitals Are Improving Care', American Heart Journal, 148 (2004), S52-S55.	Timeframe unclear
27 28 29 30	J. M. Rothschild, S. McGurk, M. Honour, A. A. McClendon, P. Srivastava, W. H. Churchill, R. M. Kaufman, J. Avorn, E. F. Cook, and D. W. Bates, 'Assessment of Education and Computerized Decision Support	Timeframe < 1 year
31 32 33 34	Interventions for Improving Transfusion Practice', Transfusion, 47 (2007), D. Bird, A. Zambuto, C. O'Donnell, J. Silva, C. Korn, R. Burke, P. Burke, and S. Agarwal, 'Adherence to Ventilator-Associated Pneumonia Bundle and Incidence of Ventilator-Associated Pneumonia in the Surgical	Timeframe < 1 year
35 36 37 38	Intensive Care Unit', Archives of Surgery, 145 (2010), 465-70. F. H. Rubin, K. Neal, K. Fenlon, S. Hassan, and S. K. Inouye, 'Sustainability and Scalability of the Hospital Elder Life Program at a Community Hospital', J Am Geriatr Soc, 59 (2011), 359-65.	No adherence studied
39 40 41 42	T. R. Sanders, C. L. Roberts, and G. L. Gilbert, 'Compliance with a Protocol for Intrapartum Antibiotic Prophylaxis against Neonatal Group B Streptococcal Sepsis in Women with Clinical Risk Factors', Infectious Diseases in Obstetrics & Gynecology, 10 (2002), 223-9.	Short term and long term data were presented combined
43 44	A. P. Savant, L. J. Britton, K. Petren, S. A. McColley, and H. H. Gutierrez, 'Sustained Improvement in Nutritional Outcomes at Two Paediatric Cystic	Timeframe < 1 year
45 46	Fibrosis Centres after Quality Improvement Collaboratives', BMJ Quality	
47 48	S. Scheithauer, F. Eitner, H. Hafner, J. Floege, and S. W. Lemmen, 'Long- Term Sustainability of Hand Hygiene Improvements in the Hemodialysis Setting', Infection, 41 (2013), 675-80.	l imeframe < 1 year
49 50 51 52 53 54	L. H. Schwamm, G. C. Fonarow, M. J. Reeves, W. Pan, M. R. Frankel, E. E. Smith, G. Ellrodt, C. P. Cannon, L. Liang, E. Peterson, and K. A. LaBresh, 'Get with the Guidelines-Stroke Is Associated with Sustained Improvement in Care for Patients Hospitalized with Acute Stroke or Transient Ischemic Attack', Circulation, 119 (2009), 107-15.	No focus on a clinical practice guideline
55 56 57	L. Bouadma, B. Mourvillier, V. Deiler, B. Le Corre, I. Lolom, B. Regnier, M. Wolff, and J. C. Lucet, 'A Multifaceted Program to Prevent Ventilator- Associated Pneumonia: Impact on Compliance with Preventive Measures',	Timeframe < 1 year
58 59 60	L. A. Shrier, S. A. Moszczenski, S. J. Emans, M. R. Laufer, and E. R. Woods, 'Three Years of a Clinical Practice Guideline for Uncomplicated Pelvic Inflammatory Disease in Adolescents', Journal of Adolescent	No adherence studied
	K. C. Stange, M. A. Goodwin, S. J. Zyzanski, and A. J. Dietrich, 'Sustainability of a Practice-Individualized Preventive Service Delivery Intervention', Am J Prev Med, 25 (2003), 296-300.	Timeframe < 1 year

1		
2	P. Sunaert, H. Bastiaens, F. Nobels, L. Feyen, G. Verbeke, E. Vermeire, J.	Timeframe unclear
3	De Maeseneer, S. Willems, and A. De Sutter, 'Effectiveness of the	
4	Introduction of a Chronic Care Model-Based Program for Type 2 Diabetes	
5	in Belgium', BMC Health Serv Res, 10 (2010), 207.	
6	K. Swain, R. Whitley, G. J. McHugo, and R. E. Drake, 'The Sustainability	Short torm and long torm
7		Short term and long term
	of Evidence-Based Practices in Routine Mental Health Agencies',	data were presented
8	Community Ment Health J, 46 (2010), 119-29.	combined
9	M. A. Swales, B. Taylor, and R. A. B. Hibbs, 'Implementing Dialectical	No adherence studied
10	Behaviour Therapy: Programme Survival in Routine Healthcare Settings',	
11	Journal of Mental Health, 21 (2012), 548-55.	
12	T. R. Talbot, J. G. Johnson, C. Fergus, J. H. Domenico, W. Schaffner, T.	Timeframe < 1 year
13	L. Daniels, G. Wilson, J. Slayton, N. Feistritzer, and G. B. Hickson,	Timonamo e Tyoar
14		
15	Sustained Improvement in Hand Hygiene Adherence: Utilizing Shared	
16	Accountability and Financial Incentives', Infection Control and Hospital	
17	D. R. Taylor, 'Sustained Success of Collaboratively Developed	Insufficient information
18	Ondansetron Guidelines', Australian Journal of Hospital Pharmacy, 25	provided
19	J. Tjia, C. Lemay, K. M. Mazor, B. A. Briesacher, T. S. Field, A. O.	Timeframe < 1 year
20	Kanaan, J. L. Donovan, L. R. Harrold, and J. H. Gurwitz, 'Dissemination of	-
20	Evidence-Based Antipsychotic Prescribing Guidelines to Nursing Homes:	
22	A Cluster Randomized Trial', Journal of the American Geriatrics Society,	
		Time of the set of the set
23	A. Mukerji, J. Narciso, C. Moore, A. McGeer, E. Kelly, and V. Shah, 'An	Timeframe < 1 year
24	Observational Study of the Hand Hygiene Initiative: A Comparison of	
25	Preintervention and Postintervention Outcomes', BMJ Open, 3 (2013).	
26	R. Van Acker, I. De Bourdeaudhuij, K. De Cocker, L. M. Klesges, A.	No adherence studied
27	Willem, and G. Cardon, 'Sustainability of the Whole-Community Project	
28	'10,000 Steps': A Longitudinal Study', BMC Public Health, 12 (2012), 155.	
29	D. Pittet, S. Hugonnet, S. Harbarth, P. Mourouga, V. Sauvan, S.	Timeframe < 1 year
30	Touveneau, and T. V. Perneger, 'Effectiveness of a Hospital-Wide	
31	Programme to Improve Compliance with Hand Hygiene. Infection Control	
32		
33	Programme.[Erratum Appears in Lancet 2000 Dec 23-	
34	B. W. Warner, K. A. Rich, H. Atherton, C. L. Andersen, and U. R. Kotagal,	No adherence studied
35	'The Sustained Impact of an Evidenced-Based Clinical Pathway for Acute	
36	Appendicitis', Seminars in Pediatric Surgery, 11 (2002), 29-35.	
37	F. H. van Tiel, T. W. O. Elenbaas, B. M. A. M. Voskuilen, J. Herczeg, F.	Timeframe < 1 year
38	W. Verheggen, B. Mochtar, and E. E. Stobberingh, 'Plan-Do-Study-Act	
39	Cycles as an Instrument for Improvement of Compliance with Infection	
40	Control Measures in Care of Patients after Cardiothoracic Surgery,	
41	B. W. Trautner, N. J. Petersen, A. Gendrett, S. Hysong, J. E. Patterson,	Timeframe < 1 year
42	and A. D. Naik, 'An Audit/Feedback Intervention Reduces Inappropriate	
43		
43 44	Screening and Treatment in Patients with Urinary Catheters', Journal of	
	the American Geriatrics Society, 62 (2014), S125.	
45	A. L. Wentworth, C. H. Fox, L. S. Kahn, K. Glaser, and R. Cadzow, 'Two	No adherence studied
46	Years after a Quality Improvement Intervention for Chronic Kidney	
47	Disease Care in a Primary Care Office', American Journal of Medical	
48	M. Whitby, M. L. McLaws, K. Slater, E. Tong, and B. Johnson, 'Three	Timeframe < 1 year
49	Successful Interventions in Health Care Workers That Improve	-
50	Compliance with Hand Hygiene: Is Sustained Replication Possible?',	
51	American Journal of Infection Control, 36 (2008), 349-55.	
52	S. Whitelaw, N. Graham, D. Black, J. Coburn, and L. Renwick,	No research article
53		No research article
54	'Developing Capacity and Achieving Sustainable Implementation in	
55	Healthy 'Settings': Insights from Nhs Health Scotland's Health Promoting	
56	Health Service Project', Health promotion international, 27 (2012), 127-37.	
57	L. J. Weireter, Jr., J. N. Collins, R. C. Britt, S. F. Reed, T. J. Novosel, and	Timeframe unclear
58	L. D. Britt, 'Impact of a Monitored Program of Care on Incidence of	
59	Ventilator-Associated Pneumonia: Results of a Longterm Performance-	
60	Improvement Project', Journal of the American College of Surgeons, 208	
	R. B. Womer, E. Tracy, W. Soo-Hoo, B. Bickert, S. DiTaranto, and J. H.	No adherence studied
	Barnsteiner, 'Multidisciplinary Systems Approach to Chemotherapy Safety:	
	Rebuilding Processes and Holding the Gains', Journal of Clinical	

D. M. Zerr, A. L. Allpress, J. Heath, R. Bornemann, and E. Bennett, 'Decreasing Hospital-Associated Rotavirus Infection: A Multidisciplinary Hand Hygiene Campaign in a Children's Hospital', Pediatric Infectious N. Zwar, J. Henderson, H. Britt, K. McGeechan, and G. Yeo, 'Influencing Antibiotic Prescribing by Prescriber Feedback and Management Guidelines: A 5-Year Follow-Up', in Family practice (2002), pp. 12-7.

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Supplementary file 3. Implementation strategies as described by the authors

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	1d.The interval between the decision to operate and surgery is 15 working days or less*(n)	. , ,	80% (n=131/163)	, Al tra% (gen.bm) 8000 mg, an	
	1e.The general practitioner is informed about the diagnosis, treatment plan and potential side-effects prior to surgery*(n)		76% (n=123/163)		
	1f.The breast nurse stays in contact with the patient after short stay (phone consultation)* (n)		12% (n=19/163)	98% (1=156/160) similar tec 13, 2025 at / 78% at /	
	Overall	59%	65%	5. 78% at Ageno	
	(excluding missing values) (original guideline comprises thirteen key recommendations)	,		Agence Bibliograp	

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adhegence LATE POST	Time frame (years)
Benenson [21]	(1)Mean time to treatment	(1)314.7 min (SD=199.0)	(1)174.7 min (SD=113.1)	(1517922 min (SD=98.8) ຊິ່ງ	3
	(2) Initial treatment given at emergency department	(2)36/63 (58.1%)	(2)90/96 (93.8%)	f91197122 (96.7%) (29119722 (96.7%) uses relation relation	
Cates [22]	Annual number of prescriptions per 100 children < 5 years old (n)	Centre 1: n=139	Centre 1: n=95	Control 1: n=76 to text and Control 2: n=61	Centre 1:3
		Centre 2: n=122	Centre 2: n=67	dente Contare tar AB AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB Do AB DO AB AB A AB A	Centre 2:2
Enriquez-Puga [23]	(1)Number of items antibiotics (co- amixiclav and quinolone) prescribed for each six-month study period per 1000 patients	(1)Intervention group:	(1)Intervention group:	(19) (1.5
	pationte	6.9	4.6	5 11 5111 5111	
		(1)Control group:	(1)Control group:	(G Control group:	
		5.8	6.2	6 3	
	(2)Number of items antidepressants (lofepramine and fluoxetine) prescribed for each six-month study period per 1000 patients	(2)Intervention group:	(2)Intervention group:	(2011) (2	
		26.7	27.7	286 .	
		(2)Control group:	(2)Control group:		
		20.9	21.4	20.8 <u>a</u>	
	Notes: regression analysis adjusting for baseline			Agence E	
Forsner [24]	1 Proportion of patients treated following guideline recommendations for depression			ibliographiqu	1.5

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adhe&nce LATE POST	Time frame (years)			
	1a Accessibility/wait time	Intervention group: 77.9% (n=95/122)	Intervention group: 89.2% (n=107/120)	⊑ g Ineerv⊗ntion group: 96% (ज्ज=216/240)				
		Control group: 59.0% (n=36/61)	Control group: 53.3% (n=32/60)	ငန်းမှုမှုနှိုင် (n=62/120)				
	1b Diagnostic assessment	Intervention group: 83.6% (n=102/122)	Intervention group: 97.5% (n=117/120)	Irpezvention group: 9克敏死(n=235/240)				
	1c Diagnostic instrument	Control group: 88.5% (n=54/61) Intervention group:	Control group: 90.0% (n=54/60) Intervention group:	C සා හිති group: 7 හි කි කි (n=95/120) In කොම ntion group:				
		12.3% (n=15/122) Control group: 1.6% (n=1/62)	28.3% (n=34/120) Control group: 0% (n=0/60)	442.26 (n=106/240) Carte di group: 0399 (n=1/120)				
	1d Standardized rating scale	Intervention group: 64.8% (n=79/122) Control group:	Intervention group: 91.7% (n=110/120) Control group:	Intervention group: 9472% (n=226/240) Centrel group:				
	1e Standardized rating scale during	44.3% (n=27/61) Intervention group:	33.3% (n=20/60) Intervention group:	3 27% (n=44/120) Ingervention group:				
	treatment	50.0% (n=61/122) Control group: 24.6% (n=15/61)	87.5% (n=105/120) Control group: 38.3% (n=23/60)	88.3% (n=212/240) Cantrel group: 38.3% (n=40/120)				
	1f Substance/drug abuse	Intervention group: 46.7% (n=57/122) Control group:	Intervention group: 87.5% (n=105/120) Control group:	المورية (n=40,120) Inservention group: 82.8% (n=213/240) Control group:				
	1g Treatment (care) plan	32.8% (n=20/61) Intervention group: 59.8% (n=73/122)	53.2% (n=32/60) Intervention group: 87.5% (n=105/120)	43.3% (n=52/120) Intervention group: 91.3% (n=219/240)				
	1h Evaluation/outcome	Control group: 42.6% (n=26/61) Intervention group:	Control group: 38.3% (n=23/60) Intervention group:	Contr g group: 27.5% (n=33/120) Intervantion group:				
		66.4% (n=81/122)	95.8% (115/120)	95.8% (n=230/240)				

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tudy ID	Primary outcome(s)	Adherence PRE	Adherence EARLY POST	Adheence LATE POST	Time frame
		measurement	measurement	measurement	(years)
		Control group:	Control group:	Cā̯ntr g l group:	
		59.0% (n=36/61)	55.0% (n=33/60)	4 6 .3 (% =58/120)	
	1i Continuity	Intervention group:	Intervention group:	Infervention group:	
		77.0% (n=94/122)	95.0% (n=114/120)	9 ઙૻ૽ૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢ %ૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢૢ	
		Control group:	Control group:	Contraction of the second seco	
		78.7% (n=48/61)	61.7% (n=37/60)	68 3 2 2 (n=82/120)	
	1j Suicide assessment	Intervention group:	Intervention group:	Intervention group:	
		40.2% (n=49/122)	95.8% (n=115/120)	9 5 5 6 (n=234/240)	
		Control group:	Control group:	Congreet group:	
		45.9% (n=28/61)	35.0% (n=21/60)	3@ \$ \$ (n=36/120)	
	1k Antidepressant medication	Intervention group:	Intervention group:	Ingervention group:	
		54.1% (n=66/122)	90.8% (n=109/120)	92.50 (n=222/240)	
		Control group:	Control group:	Cetting group:	
		45.9% (n=28/61)	36.7% (n=22/60)	4.7% (n=50/120)	
				íbm Al tr	
	2 Proportion of patients treated following guideline recommendations for suicidal behaviour in % (n)		101	open.bmj.c aining, and	
	2a Accessibility/wait time	Intervention group:	Intervention group:	Ingervention group:	
		15.7% (n=19/121)	14.2% (n=17/120)	59,2% (n=142/240)	
		Control group:	Control group:	Cigntrel group:	
		29.5% (n=18/61)	31.7% (n=19/60)	0 k (n 0/120)	
	2b Diagnostic assessment	Intervention group:	Intervention group:	Ingervention group:	
		49.6% (n=60/121)	73.3% (n=88/120)	9 .7% (n=220/240)	
		Control group:	Control group:	Contrel group:	
		26.2% (n=16/61)	16.7% (n=10/60)	0% (n≩0)	
	2c Diagnostic instrument	Intervention group:	Intervention group:	Intervention group:	
	-	0% (n=0/121)	7.5% (n=9/120)	7.5% (m)=18)	
		Control group:	Control group:	Contred group:	
		0% (n=0/61)	0% (n=0/60)	0% (r <mark>ệ</mark> 0)	
	2d Standardized rating scale	Intervention group:	Intervention group:	Intervention group:	

		BMJ	Open	ijopen-2015- 1 by copyrig	
Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	AdheBence LATE POST	Time frame (years)
		41.3% (n=50/121)	67.5% (n=81/120)	7 & 3%2(n=188)	
		Control group:	Control group:	Contro group:	
		27.9% (n=17/61)	16.7% (n=10/60)	0.33% S h=1)	
	2e Standardized rating scale during treatment	Intervention group:	Intervention group:	Irမ်းမျှော် ဖွင့်နှင့်	
		16.5% (n=20/121)	52.5% (n=63/120)	5 క్షోత్రోస్తే (n=134)	
		Control group:	Control group:	Canard group:	
		16.4% (n=10/61)	10.0% (n=6/60)	5.9% (m=6)	
	2f Substance/drug abuse	Intervention group:	Intervention group:	5 මිදී ආ=6) Inægvention group:	
		52.1% (n=63/121)	64.2% (n=77/120)	88	
		Control group:	Control group:	Cart rai group:	
		55.7% (n=34/61)	56.7% (n=34/60)	29.26 (n=35)	
	2g Treatment (care) plan	Intervention group:	Intervention group:	Ingenvention group:	
		37.4% (n=68/182)	58.9% (n=106/120)	7 4 2% (n=190)	
		Control group:	Control group:	CEntre group:	
		44.3% (n=27/61)	41.7% (n=25/60)	0 🛓 % 💑 = 1)	
	2h Evaluation/outcome	Intervention group:	Intervention group:	Ingervention group:	
		20.7% (n=25/121)	47.5% (n=57/120)	517% (n=124)	
		Control group:	Control group:	Control group:	
		19.7% (n=12/61)	8.3% (n=5/60)	0 😼 (n 🔁 0)	
	2i Continuity	Intervention group:	Intervention group:	Intervention group:	
		86.0% (n=104/121)	81.7% (n=98/120)	98.3% (n=219)	
		Control group:	Control group:	Cantrol group:	
		49.2% (n=30/61)	31.7% (n=19/60)	0∰ (n _̄ , 0)	
	2j Suicide assessment	Intervention group:	Intervention group:	Intervention group:	
		55.4% (n=67/121)	93.3% (n=112/120)	97.1% ₽ (n=233)	
		Control group:	Control group:	Control group:	
		82.0% (n=50/61)	73.3% (n=44/60)	56.7% (n=68)	
	2k Specialist assessment	Intervention group:	Intervention group:	Intervention group:	
		50.4% (n=61/121)	85.4% (n=103/120)	91.7% (n=220)	
		Control group:	Control group:	Contrel group:	
		83.6% (n=51/61)	83.3% (n=50/60)	71.7% (n=86)	
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f 59		BMJ	Open	ijopen-2015- 1 by copyrig	
Study ID	Primary outcome(s)	Adherence PRE	Adherence EARLY POST	Agheence LATE POST	Time frame
		measurement	measurement	measurement	(years)
	2l Follow-up	Intervention group:	Intervention group:	Ingervention group:	
		72.7% (n=88/121)	88.3% (n=106/120)	9 @ .1% & (n=221)	
		Control group:	Control group:	Centre group:	
		75.4% (n=46/61)	65.0% (n=39/60)	3 ኇ፝ጟ% ዿ፝(n=45)	
	2m Evaluation assessment	Intervention group:	Intervention group:	In to group:	
		32.2% (n=39/121)	64.2% (n=77/120)	7 ₩₩ ₩	
		Control group:	Control group:	Condition of the second	
		18.0% (n=11/61)	13.3% (n=8/60)		
Higuchi [25]	1 Proportion of patients receiving care according to asthma guideline recommendations	Not clear	(total n=10)	(tane=62) The right of the second sec	Asthma: 4
	1a Respiratory assessment done	~0, ,	n=10/10 100%	from 2 98.4% n m m m m m m m m m m m m m m m m m m m	Diabetes: 3
	Level of asthma control documented for :	6		, Al tra	
	1b medication in use		n=10/10 100%	n∰61/80/2 98.4%	
	1c Use of B2 agonist		n=10/10 100%	n 🕰 52/ <mark>6</mark> 2 84.4%	
	1d Experience of daytime symptoms		n=8/10 80.0%	n = 32/ 52 51.7%	
	1e Experience of night time and/or awaking symptoms		n=8/10 80.0%	n % 16/ §2 26.2%	
	1f Physical activity		n= unclear 77.8%	n = 29/22 46.8%	
	1g Absence from school or work		n=7/10 70.0%	n 🚔 3/6 🧝 4.9%	
	1h Exacerbation		n=7/10 70.0%	n = 47/8 276.2%	
	1i Individualised action plan developed for client's discharge		n=7/10 70.0%	n <mark>ਊ</mark> 2/68 3.2%	
	1j Baseline teaching information on asthma provided to patient by a nurse		n=6/10 60.0%	n=16/8225.4% Agen	
	1k Written information on asthma provided		n=6/10 60.0%	n=4/62 6.6% Bibliographi	

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adhegence LATE POST	Time frame (years)
	2 Proportion of patients receiving care according to diabetes foot care guideline recommendations (n=12)		(total n=50)	(total g=65)	
	2a Assessment for risk factors: foot ulceration/amputation		n=22/50 44.0%	6 Decent Interest national nat	
	2b Assessment loss of protective sensation		n=5/50 10.0%		
	2c Assessment Structural or biochemical abnormalities		n=3/50 6.0%	n = 500 - 500.8% n = 500 - 500.8% xt and - 552.3% d and - 552.3%	
	2d Assessment evidence of impaired circulation		n=1/50 2.0%		
	2e Assessment Deficit in self-care behaviour	°0,	n=14/50 28.0%	n #10/65 15.4% = # # 9 n = 49/65 63.1%	
	2f Monofilament used to assess sensation in the feet		n=21/50 42.0%	ā. ē	
	2g Risk classification for foot ulcer/amputation	Č	n=37/50 73.7%	n≜30/65 45.9% mjopen. training.	
	Basic foot care education done on:			n.b	
	2h Client's risk factors		n=15/50 30.0%	n∰53/62 81.5%	
	2i Daily self-inspection of feet		n=15/50 30.0%	n ≝ 53/ <mark>§</mark> 2 81.5%	
	2j Proper nail and skin care		n=15/50 30.0%	n = 54/ 9 2 83.1%	
	2k Injury prevention		n=15/50 30.0%	n 5 53/62 81.5%	
	2l When to seek help		n=15/50 30.0%	n=54/02 83.1%	
Kelly [26]	Proportion of patients receiving IM narcotic analgesia	76% (n=48/63)	NA	3% (n <u>u</u> 2/65)	2
Knops [27]	(1)Proportion of patients receiving care according to fluid balance guideline recommendations	(1)NA	(1)NA	(1)10∰% (534/534) cc Bibliogra	7

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f 59		BMJ Ope	en	jopen-2015- I by copyrig	
Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adherence LATE POST	Time frame (years)
	(2)Proportion of patients receiving care according to body temperature guideline recommendations	(2)NA	(2)91%	(2550) 30 (617/1226) 10 29 of Dece 15 Dece	
Loszadi [28]	Proportion of patients receiving care according to guideline recommendations	61% (n=29/48)	79% (n=38/48)	9월% 동물=44/48) eligner ate 20	unclear, >2
Mclaws [29]	(hand hygiene events observed / hand hygiene opportunities)x100 (%)	47% (3795/8057)	62% (NA)	500 text and	1.5
Stephan [30]	Proportion of patients receiving care according to guideline recommendations		82.2% (n=410/499)	8667/62(n=242/300)	1.5
Wakefield [31]	according to guideline recommendations		NA	ttp://bmjopen.bmj.c) . ∯g, Al training, and	1.5
Williams [32]	Proportion of patients treated according to guideline recommendations for the repair and follow-up of third degree tears		0	similar technologies.	2
	A Senior SpR present	30% (n=13/44)	40% (n=20/50)	6 6 2 3 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4 3 4	
	Theatre	70% (n=31/44)	82% (n=41/50)	97% (=29/30)	
	GA/Regional	70% (n=31/44)	82% (n=41/50)	97% () 8=29/30) 8	
	Prolene	64% (n=28/44)	76% (n=38/50)	93% (# =28/30)	

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	୍ରୁଙ୍ଗୁ ଜୁ Agheଛnce LATE POST measerement	Time frame (years)
	Overlap documented	30% (n=13/44)	54% (n=27/50)	628% (29=20/30) 103 129 105 D	
na: not applical		veer review only - http://bmjope		, 2025 at Agence Bibliographique ogies.	

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1 2	Supplementary File 5: Risk of bia	as using the Downs and					ight, in	5-0080			
3 4 5		Author:	Ament [20]	Benenson [21]	Cates [22]	Enriquez [23]	Forsnerding	73 Higuchi 1225] 26	Kelly [26]	Knops [27]	Lozsadi [28]
6 7 8 9	Reporting1 Is the hypothesis/aim/objective of the study clearly described?	comment	yes	yes	no	yes	yes s	Decembe	yes	yes	yes
10 11 12	2 Are the main outcomes to be measured clearly described in the Introduction or Methods section?		yes	yes	yes	yes	yes ated to	er 2015. E	yes	yes	yes
13 14 15 16	3 Are the characteristics of the patients included in the study clearly described ?	Patients' was replaced by 'professionals'	yes	yes	yes	yes	ā	Superieur	no	yes	yes
17 18	4 Are the interventions of interest clearly described?	Intervention was replaced by guideline	yes	yes	yes	yes		r (Ares Arom	yes	yes	yes
19 20 21 22	 5 Are the distributions of principal confounders in each group of subjects to be compared clearly described? 	guideline	yes	yes	no	yes	yes ning,	m attp://bmjopen. FS)	no	no	yes
23 24	6 Are the main findings of the study clearly described?		yes	yes	yes	yes	yes ni	es	no	yes	yes
24 25 26 27 28	7 Does the study provide estimates of the random variability in the data for the main outcomes?		na	na	na	na	Al training, and similar technologies.	banj.com/	na	na	na
29 30 31 32	8 Have all important adverse events that may be a consequence of the intervention been reported?		na	na	na	na	na na	onaJune 13,	na	na	na
32 33 34 35	 9 Have the characteristics of patients lost to follow-up been described? 	Patients' was replaced by 'professionals'	utd	utd	utd	utd	utd ogies.	, 2025 at	utd	utd	utd
36 37 38 39 40 41 42 43	 Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001? 		yes	yes	utd	yes	yes	: Agence Bibliographique	yes	utd	utd
44 45 46 47		For peer review on	ly - http://b	omjopen.bm	j.com/site/	/about/guid	lelines.xhtr	ne ne			

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		Author:	Ament [20]	Benenson [21]	Cates [22]	Enriquez [23]	Borsner [24] 5	giguchi	Kelly [26]	Knops [27]	Lozsadi [28]
11	External validity Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'. In case of general guideline and a multicentre study: yes. In case of a centre specific guideline and one guideline: yes.	yes	no	utd	yes	yes yes	3 on ^O 29 Decembe	no	yes	no
12	Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'	yes	utd	utd	no	yes yes	r 2015 Downloaded from	utd	yes	utd
13	Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?		no	yes	yes	yes	yes yes	softrom http://bn	yes	yes	no
14	Internal validity - bias Was an attempt made to blind study subjects to the intervention they have received?	Subjects' was replaced by 'professionals'	na	na	na	na	na na similar technologies.	njopæn.bmj.com#on	na	na	na
15	Was an attempt made to blind those measuring the main outcomes of the intervention?		utd	utd	utd	utd	utd utd	ond on June	utd	utd	utd
16	If any of the results of the study were based on "data dredging", was this made clear?		no	no	no	no	no nologies.	e සි, 2025 at Agence Bibliographique	no	no	yes
		For peer review on	ly - http://l	bmjopen.bn	nj.com/site/	/about/guid	delines.xhtr	ne de l			

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1 2 3 4 5 6 7 8 9 10	17 In trials and cohort studies, of the analyses adjust for differ lengths of follow-up of patier in case-control studies, is the time period between the intervention and outcome the same for cases and controls	ent 'professionals' its, or e	Ament [20] na	Benenson [21] na	Cates [22] na	Enriquez [23] yes	Forsnee [24] yes	173 23 29 December Enseig	Kelly [26] na	Knops [27] na	Lozsadi [28] na
11 12 13	18 Were the statistical tests use assess the main outcomes appropriate?	ed to	yes	yes	no	yes	yes to text	2015Down	yes	no	utd
14 15	19 Was compliance with the intervention/s reliable?		na	na	na	na	na and	ownloade Superieu	na	na	na
16 17 18 19	20 Were the main outcome measures used accurate (va and reliable)?	lid	yes	yes	yes	yes	yes data mining	ed from http://www.automatic	yes	yes	yes
20 21 22 23	Internal validity - confound (selection bias and power)			6			g, Al trair	p://bmjop			
24 25 26 27 28	21 Were the patients in differen intervention groups (trials an cohort studies) or were the c and controls (case-control studies) recruited from the sa population?	d 'professionals' ases	na	na	na	yes	Al training, and similar	://bmjopen.bmj.com/ on	na	na	na
29 30 31 32 33 34 35	22 Were study subjects in differ intervention groups (trials an cohort studies) or were the c and controls (case-control studies) recruited over the sa period of time?	d by 'professionals' ases	na	na	na	yes	yes technologie	Æine 13, 20	na	na	na
36 37 38 39 40 41 42 43	23 Were study subjects random to intervention groups?	nised Subjects' was replaced by 'professionals' For peer review or	no	no	no	yes	yes	vgence Bibliographiqu	no	no	no
44 45 46 47		For peer review or	nly - http://	ˈbmjopen.bn	nj.com/site	e/about/guid	delines.xh	e tmbe -			

			BMJ Ope	en		1 by copyrig	ijopen-2015-0 0 80			Pa
	Author:	Ament [20]	Benenson [21]	Cates [22]	Enriquez [23]	Forsner	b Biguchi B251	Kelly [26]	Knops [27]	Lozsadi [28]
24 Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?		no	no	no	no	by copyright_including for uses related	023 2015 Enseitneme	no	no	no
25 Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?		no	yes	no	yes		eE2015. Do	yes	no	no
26 Were losses of patients to follow- up taken into account?	Patients was replaced by professionals	utd	utd	utd	yes	utd X		utd	utd	utd
 27 Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%? utd: Items were qualified as 'unable to na: not applicable 	determine' when information wa			no		or (CEEC) . Id data mining, Al training, and similar technologies. ₽	Downloaded from http://bmjopen.bmj.com/ on June 13, 2025 at Agence Bibliographic	no	no	no
	For peer review on	ly - http://b	omjopen.bm	j.com/site/	/about/guid	elines.xhtr	nede I			

		Author:	McLaws [29]	Stephan [30]	Wakefield [31]	Williams [32]
1	Reporting Is the hypothesis/aim/objective of the study clearly described?	comment	yes	yes	yes	yes
2	Are the main outcomes to be measured clearly described in the Introduction or Methods section?		yes	yes	no	yes
3	Are the characteristics of the patients included in the study clearly described ?	Patients' was replaced by 'professionals'	yes	no	no	no
4	Are the interventions of interest clearly described?	Intervention was replaced by guideline	yes	yes	yes	yes
5	Are the distributions of principal confounders in each group of subjects to be compared clearly described?		no	yes	no	yes
6	Are the main findings of the study clearly described?		yes	yes	yes	yes
7	Does the study provide estimates of the random variability in the data for the main outcomes?		na	na	na	na
8	Have all important adverse events that may be a consequence of the intervention been reported?		na	na	na	na
9	Have the characteristics of patients lost to follow-up been described?	Patients' was replaced by 'professionals'	utd	utd	utd	utd
10	Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?		yes	yes	yes	yes



			0	M. 1 / 1	
	Author:	McLaws [29]	Stephan [30]	Wakefield [31]	Williams [32]
External validity Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'. In case of general guideline and a multicentre study: yes. In case of a centre specific guideline and one guideline: yes.	yes	no	no	yes
2 Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'	yes	utd	utd	yes
B Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?		yes	no	no	no
Internal validity - bias Was an attempt made to blind study subjects to the intervention they have received?	Subjects' was replaced by 'professionals'	na	na	na	na
Was an attempt made to blind those measuring the main outcomes of the intervention?		utd	utd	utd	utd
6 If any of the results of the study were based on "data dredging", was this made clear?		yes	yes	no	yes
	For peer review on				

3

		Author:	McLaws [29]	Stephan [30]	Wakefield [31]	Williams [32]
17	In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls ?	Patients' was replaced by 'professionals'	na	na	na	na
18	Were the statistical tests used to assess the main outcomes appropriate?		yes	yes	yes	yes
19	Was compliance with the intervention/s reliable?		na	na	na	na
20	Were the main outcome measures used accurate (valid and reliable)?		yes	yes	yes	yes
	Internal validity - confounding			6		
	(selection bias and power)					
21	Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?	Patients' was replaced by 'professionals'	na	na	na	na
22	Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?	Study subjects' was replaced by 'professionals'	na	na	na	na
23	Were study subjects randomised to intervention groups?	Subjects' was replaced by 'professionals' For peer review on	no	no	no	no

 assignment concealed from both patients and health care staff until recruitment was complete and irrevocable? 5 Was there adequate adjustment for confounding in the analyses from which the main findings were drawn? 6 Were losses of patients to follow- patients was replaced by utd utd utd utd utd utd utd professionals 7 Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%? d: Items were qualified as 'unable to determine' when information was 				BMJ Op	ben	
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 6 Were losses of patients to follow- up taken into account? 7 Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 	from which the main findings		yes	yes	no	no
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td: Items were qualified as 'unable to determine' when information was a: not applicable	probability value for a difference being due to chance is less than					
	td: Items were qualified as 'unable to a: not applicable	determine' when information v	/as			
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Supplementary file 6. PR	ISMA Ch	ecklist	
Section/topic	#	Checklist item	Reported o page #
TITLE		es s a s	
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives data sources; study eligibility criteria, participants, and interventions; study appraisal and synthe set background; objectives data sources; study limitations; conclusions and implications of key findings; systematic review receives ation number.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to the icipants, interventions, comparisons, outcomes, and study design (PICOS).	4
METHODS		,	
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	na
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	4,5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5, additiona file 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	4,5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independer ty, in duplicate) and any processes for obtaining and confirming data from investigators.	5,6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5,6

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Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including appecification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means)	na
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if describe the methods of handling data and combining results of studies, if describe the methods of handling measures of consistency (e.g., I ²) for each meta-analysis.	na
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evider de.g., publication bias, selective reporting within studies).	na
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, oneta-regression), if done, indicating which were pre-specified.	na
RESULTS		nieu	
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the Review, with reasons for exclusions at each stage, ideally with a flow diagram.	7
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., stress size, PICOS, follow-up period) and provide the citations.	7, table 1
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level as essment (see item 12).	12, table 3
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) single summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	10, table 2, additional file 4
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	na
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	12, table 3
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	10
DISCUSSION		gie	
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12,13
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-evel (e.g., incomplete retrieval of identified research, reporting bias).	13,14

e 59 of 59		ijopen-2015-00 9 by copyright,	
Conclusions FUNDING	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	14
Funding	27	Describe sources of funding for the systematic review and other support (e.g., stopply of data); role of funders for the systematic review.	15
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Sustainability of professionals' adherence to clinical practice guidelines in medical care: a systematic review

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SCHOLARONE[™] Manuscripts

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2 3	1	Sustainability of professionals' adherence to clinical practice
4	2	guidelines in medical care: a systematic review
5	Z	guidennes in medical care. a systematic review
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7 8	4	senior scientist ^{1,4} , Carmen D Dirksen, professor ⁵ , Trudy van der Weijden, professor ¹ , Jos Kleijnen,
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43 ABSTRACT

Objectives To evaluate 1) the state of the art in sustainability research and 2) the outcomes of 45 professionals' adherence to guideline recommendations in medical practice.

Design Systematic review

47 Data sources Searches were conducted till August 2015 in MEDLINE, CINAHL, EMBASE, Cochrane 48 Central Register of Controlled Trials (CENTRAL) and the Guidelines International Network (GIN) 49 library. A snowball strategy, in which reference sections of other reviews and of included papers were 50 searched, was used to identify additional papers.

51 Eligibility criteria Studies needed to be focused on sustainability and on professionals' adherence to 52 clinical practice guidelines in medical care. Studies had to include at least two measurements: one 53 before (PRE) or immediately after implementation (EARLY POST) and one measurement longer than 54 one year after active implementation (LATE POST).

Results The search retrieved 4219 items, of which fourteen studies met the inclusion criteria, involving eighteen sustainability evaluations. The mean timeframe between the end of active implementation and the sustainability evaluation was 2.6 years [min 1.5 - max 7.0]. The studies were heterogeneous with respect to their methodology. Sustainability was considered to be successful if performance in terms of professionals' adherence was fully maintained in the late post-implementation phase. Long-term sustainability of professionals' adherence was reported in seven out of eighteen evaluations, adherence was not sustained in six evaluations, four evaluations showed mixed sustainability results and in one evaluation it was unclear whether the professional adherence was sustained.

Conclusions 2) Professionals' adherence to a clinical practice guideline in medical care decreased after more than one year after implementation in about half of the cases. **1)** Due to the limited number of studies, the absence of a uniform definition, the high risk of bias, and the mixed results of studies, no firm conclusion about the sustainability of professionals' adherence to guidelines in medical practice can be drawn.

Key words: sustainability, clinical practice guidelines, medical care, quality improvement,
 implementation, adherence

79 Article summary

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8	3 Strengths and limitations of this study
8	4 - This is the first systematic review of the literature that has considered professionals'
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4 8	7 their adherence to a clinical practice guideline.
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1 ⁵ 2 9	2 - Sustainability research is not well indexed in electronic databases, and text word searches
3 4 9	are prone to high recall and low specificity. However, it is likely that the use of a broad
5 <u>9</u> .	4 variety of search terms that covered sustainability, has downsized the number of relevant
6 7 9	studies missed and is a strength of the review.
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To facilitate the translation of the most recent evidence into practice, guidelines are developed and implemented. Following the Institute of Medicine (IOM), clinical practice guidelines are "statements that include recommendations intended to optimize patient care that are informed by a systematic review of evidence and an assessment of the benefit and harms of alternative care options" (1). Guidelines contain practical evidence based advice for professionals and patients and aim to improve the guality of care (2). In general, uptake of guidelines does not happen spontaneously and often an active implementation approach is required (3). Moreover, once a guideline is successfully implemented in practice, it may be difficult to sustain the quality improvements over a longer period of time. People tend to fall back into old routines (4) which may impact long-term adherence to a guideline.

The road towards sustainability of health care innovations into practice is suggested to be a dynamic process (5) and sustainable adherence may not be self-evident without continued efforts. Sustainable change of professionals' behaviour has the potential to result in more optimal health care delivery and efficiency. Not sustaining quality improvements can result in nihilistic attitudes towards future innovation. In recent years, sustainability has gained attention in healthcare. Unfortunately, the concept of sustainability is still underdeveloped (6, 7). Some existing reviews studied sustainability from a wide health care perspective, including studies varying from medical care to public health. Results showed that determinants of sustainability varied widely between healthcare areas (8, 9) and suggest that partial sustainability of health care innovations is more common than full sustainability (10).

 136 In this systematic review, the scope of sustainability research will be narrowed to professionals' 137 adherence to clinical practice guidelines in medical care. The aim of the current review was to 138 evaluate the state of the art in sustainability research and the level of sustained professionals' 139 adherence to guideline recommendations in medical practice more than one year following the 140 cessation of the implementation project.

142 METHODS

143 Eligibility criteria

Studies needed to be focused on sustainability and on clinical practice guidelines. Sustainability was described as "Sustainability of change exists when a newly implemented innovation continues to deliver the benefits achieved over a longer period of time, certainly does not return to the usual processes and becomes 'the way things are done around here' (11), even after the implementation project is no longer actively carried out, until a better innovation comes along" (12). Studies had to include at least two measurements: one before (PRE) or immediately after implementation (EARLY POST) and one measurement longer than one year after active implementation (LATE POST). All activities to facilitate the adherence to clinical practice guidelines were labelled as part of the implementation project. Studies needed to be focused on professionals' adherence to a clinical practice guideline. Studies only using self-reported adherence were excluded to reduce the chance of

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social desirability bias and an overestimation of results (13). Lastly, studies had to focus on medical
care. Participants had to be healthcare professionals who deliver direct patient care. There were no
restrictions on study design of the research articles.

- 158 Search methods for identification of studies
- 159 Electronic searches

We searched MEDLINE (OvidSP) (1946- February 2014), CINAHL (EBSCO Host) (1982- February 2014), EMBASE (OvidSP) (February 2014), Cochrane Central Register of Controlled Trials (CENTRAL) and the Guidelines International Network (GIN) library for studies. The electronic search strategy was designed to focus on sustainability of guideline recommendations. Free text terms and MeSH terms regarding sustainability, quality improvement, impact and guideline recommendations were used. An information expert checked the developed search strategies (supplementary file 1). Before final analyses, update searches were performed to identify possible additional studies (June 26, 2014 and August 4, 2015).

169 Searching other resources

A snowball strategy was performed, in which the reference sections of reviews (6-10, 14) (15) (16) and research papers on sustainability (17, 18) were searched. Also, databases such as PubMed and the Web of Knowledge Science Citation Index were used to locate publications and publications citing the original references. The process was repeated for any new relevant publication found.

175 Data collection and analysis

176 Selection of studies

All records were merged into a bibliographic database and screened independently by two reviewers (SA, JdG) based on title and abstract. Full text screening was performed by two reviewers (SA, JdG). Disagreement on selection was resolved in consensus meetings with a third reviewer (TvW). Reasons for exclusion were documented during the full text screening. If more clarification or details of a study were needed, an author was contacted. Authors of conference abstracts were emailed and were asked to send the research protocol. Duplicate papers were identified and all papers published on one study were used for retrieving information.

185 Data extraction and management

Data of the methodology and results were independently extracted by two reviewers (SA, JdG),
guided by a predefined data extraction form. Effective Practice and Organisation of Care (EPOC) Data
Collection Checklist (19) items (e.g. location of care, type of targeted behaviour, implementation
interventions) were integrated in the data extraction form. The data extraction form was developed by

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the authors and was pilot tested. The following study characteristics were recorded: study design, publication year, whether the study was executed in a single centre or in multiple centres, type of targeted behaviour, location of care, the name of the clinical practice guideline, clinical specialty, the implementation activities used and whether or not the implementation strategy was externally guided. An externally guided implementation strategy is a strategy which is lead and supported by an external expert organisation. With respect to the methodology of the sustainability evaluation the following data were extracted: the timeframe between the end of the implementation strategy and the sustainability evaluation, the applied definition of sustainability, the data collection method, whether the evaluation was performed on patient, hospital or multiple hospital level and whether the sustainability evaluation was performed on single or multiple centre level. With respect to the outcome measures of the studies, data on the professionals' adherence rates before, early after implementation and longer than one year after implementation, and the authors' comments with respect to the sustainability of professionals' adherence were extracted. Adherence was presented in terms of proportion of patients receiving treatment according to the clinical practice guideline recommendations. If sustainability of professionals' adherence to a clinical practice guideline was evaluated at multiple post-implementation moments, the latest evaluation was selected as LATE POST measurement. The authors (SA and JdG) checked if updates of the clinical practice guidelines had become available in the post-implementation phase (e.g. between the EARLY POST and the LATE POST measurement), which may explain reduced professionals' adherence. Disagreement on data extraction was resolved in consensus meetings with a third reviewer (TvW).

211 Assessment of risk of bias in included studies

Risk of bias assessment was independently conducted by two authors using the Downs and Black checklist for randomized and non-randomized studies (20). This is a checklist which can be used for checking the risk of bias of original research articles of various study designs. Results were interpreted under consideration of risk of bias. The assessments were also used for recommendations for further research by identifying elements of studies that can be improved in future studies. The checklist was adapted to the research question. Risk of bias of the studies was presented on reporting, external validity, internal validity (bias and confounding), power and overall level.

220 Analysis

The analysis was narrative. This included a summary of the methodological characteristics of the sustainability evaluations, descriptions of the level of sustainability as mentioned by the author, and the level of sustained professionals' adherence compared to results achieved immediately after implementation. Sustainability was considered to be successful if performance in terms of professionals' adherence was fully maintained in the late post-implementation phase. A sensitivity analysis was performed by applying a 90% instead of 100% adherence criterion of sustainability.

228 RESULTS

229 Description of studies

For this review, 4219 items were retrieved and screened based on title and abstract, and 185 studies were assessed based on full text reading. Figure 1 shows the study selection process as recommended by the PRISMA statement (21) (supplementary file 2). Fourteen studies met the inclusion criteria for this review, describing eighteen sustainability evaluations (22-35). Table 1 presents the characteristics of the included studies. Two publications were published before and twelve after 2000 (23, 33). In six studies the targeted behaviour was prescribing (24, 25, 28, 30, 33, 35), in four studies procedures (29, 31, 32, 34), in three studies general management of a problem (22, 26, 27) and in one study (23) general management of a problem and prescribing. The location of care was inpatient in five studies (23, 28, 29, 32, 34), outpatient in four studies (24-26, 35) and mixed in five studies (22, 27, 30, 31, 33).

The implementation strategy was described in thirteen studies (table 2) (22-27, 29-41). According to the EPOC checklist classification, in one study (24), a single element implementation strategy was executed while in the other twelve studies a multi-faceted implementation strategy was executed. Implementation activities were professional targeted interventions (n=12) {Ament, 2014 #20;de Kok, 2010 #33;Ament, 2014 #34;Benenson, 1999 #21;Enriquez-Puga, 2009 #23;Forsner, 2010 #24;Higuchi, 2011 #25;Knops, 2010 #27;Mank, 2003 #35;Knops, 2010 #27;Lozsadi, 2006 #28;Storm-Versloot, 2012 #36;Pantle, 2009 #37;Stephan, 2006 #30;Wakefield, 1998 #31;Williams, 2003 #32;Gerber, 2013 #67;Gerber, 2014 #69}, followed by organisational interventions (n=6) (22, 23, 26, 33, 34, 36, 37, 39, 40) and financial interventions (n=1) (27). In six studies the implementation strategy was facilitated by external experts (22, 25-27, 31, 35). In one study it was unclear whether the implementation strategy was externally supported (28).

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Study ID	Study design	Clinical practice guideline	Clinical specialty	Clinical practice guideline was updated in the post-implementation phase* (yes/no)	Time frame (years)
Ament (22) (2014) The Netherlands	case series	Guideline to facilitate short stay for breast cancer surgery (36)	Surgery	Between 2007-2012: No (42, 43)**	5
Benenson (23) (1999) UK	case series	Clinical pathway for pneumonia (44)	Various	Between 1995-1997: No (45, 46)	3
Cates (24)(2009) UK	case series	Guideline for antibiotic prescription for children with earache and inflamed eardrums who are not unduly ill (47)	General practice	Between 1998-2001: No (48)**	Centre 1: 3 Centre 2: 2
Enriquez-Puga (25) (2009) UK	RCT	 (1) Antidepressant prescription guideline and (49) (2) Antibiotic prescription guideline (50) Control group: intervention groups were each other's control group 	General practice	Guideline 1 between 2003-2004: yes (51) Guideline 2 between 2003-2004: No (50)	1.5
Forsner (26) (2010) Sweden	RCT	Clinical guideline (1) for depression (52) and (2) for suicidal behaviours (48) Control group: received the guideline but were not included in the intervention	Psychiatry	UTD	1.5
Gerber (35) (2014) USA	case series	Outpatient antimicrobial stewardship intervention (53)	Pediatric primary care	Between 2011 - 2014: no (53)	1.5
Higuchi (27) (2011) Canada	case series	 (1) Adult Asthma Care Best Practice Guideline (54) and (2) Reducing Foot Complications for People with Diabetes Best Practice Guideline (55) 	(1)Various (2)Various	Guideline 1 between 2002-2006: Yes (56) Guideline 2 between 2003-2006: Yes (57)	(1) 4 (2) 3
Kelly (28) (2000) Australia	case series	Guideline for nurse managed titrated narcotic analgesia (58)	Emergency medicine	UTD	2
Knops (29) (2010) The Netherlands	case series	 (1) a fluid balance guideline for oncology patients (38) (2) a body temperature guideline for postoperative patients (59) 	(1) Various (2) Surgery	Guideline 1 UTD (local guideline) Guideline 2 UTD (local guideline)	7
Loszadi (30) (2006) UK	case series	Guidelines for the prevention and management of corticosteroid induced osteoporosis (60)	Neurology	UTD	Unknown > 2
Mclaws (31) (2009) Australia	case series	Guidelines on Hand Hygiene in Health Care (61)	Various	Between 2007-2008: No (61)	1.5
Stephan (32)	case	Guideline for urine catheterization management for surgical	Orthopaedic /	UTD (local guideline)	1.5

Page	9	of	78
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38 39 40 41 42 43 44 45 46 47	262	

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(2006) Switzerland	series	procedures (62)	abdominal		
Wakefield (33)	case	Guideline for the use of transdermal fentanyl for chronic pain	surgery Various	UTD	1.5
(1998) USA	series	(33)	Various	010	1.5
Williams (34)	case	Guideline for the repair and follow-up of third degree tears	Obstetrics and	UTD (local guideline)	2
(2003) UK	series	(63)	gynaecology		
		en the POST and LATE POST measurement (yes) or was not update	d between the PC	OST and LATE POST measurement (no)
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263 Table 2 Implementation strategies as described by the authors

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	Professional ir	iterventions				Financial interventions
Author	Audit and feedback	Reminders	Marketing	Mass media	Other	Other
Ament [22]	•					
Benenson [23]						
Cates [24]						
Enriquez-Puga [25], Antidepressant prescription guideline	•		•			
Enriquez-Puga [25], antibiotic prescription guideline	•		•			
Forsner [26], depression guideline	•				participation in local network	
Forsner [26], suicidal behaviours guideline	•				participation in local network	
Gerber [35]	•					
Higuchi [27], Adult Asthma Care Best Practice Guideline	°a			•		Additional funding to replace nurses while they performed implementatic activities
Higuchi [27], Reducing Foot Complications for People with Diabetes Best Practice Guideline	•			•		Additional funding to replace nurses while they performed implementatio activities
Kelly [28] *						
Knops [29] fluid balance guideline for oncology patients *						
Knops [29] body temperature guideline for postoperative patients	•		•			
Loszadi [30]	•					
McLaws [31]	•	•		•		
Stephan [32]	•	•		•		
Wakefield [33]		•				
Williams [34]	•					
 *no information about the implementation strategy provided item explicitly stated in one of the related articles of the study 					5	
		1	1			

		Organisational ir	nterventions						Other
,	Author	Revision of professional roles	Clinical multidisciplinary team	Formal integration of services	Skill mix changes	Continuity of care	Changes in physical structure, facilities and equipment	Presence and organisation of quality monitoring	
,	Ament [22]		•	•		•			
I	Benenson [23]		•	•		•			Standard antibiotic order sheet
(Cates [24]								Evidence-based patient handout
,	Enriquez-Puga [25], Antidepressant prescription guideline								
	Enriquez-Puga [25],								
	antibiotic prescription								
ł	guideline								
ł	Forsner [26], depression guideline		•						
I	Forsner [26], suicidal behaviours guideline Gorbor [25]		•						
	Gerber [35] Higuchi [27], Adult Asthma								New documentation procedures
	Care Best Practice Guideline								New documentation procedures
(Higuchi [27], Reducing Foot Complications for People with Diabetes Best Practice								New documentation procedures
	Guideline Kelly [28] *								
l	Knops [29] fluid balance guideline for oncology								
 	patients * Knops [29] body temperature guideline for postoperative patients								
	Loszadi [30]								
	McLaws [31]						•		
	Stephan [32]						-	-	
	Wakefield [33]		•						
	Williams [34]						•		
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270 Characteristics of the sustainability evaluations

The mean timeframe between the end of the implementation strategy and the sustainability evaluation of thirteen studies was 2.6 years [min 1.5 - max 7.0]. The actual timeframe of one evaluation was unclear, but was at least two years (30). Two studies referred to a definition of sustainability (22, 27). Eight studies used a retrospective data collection method (23-29, 33), three studies used a prospective data collection method (31, 32, 35) and three studies used both a prospective and a retrospective data collection method (22, 30, 34). Ten papers reported the level of sustained adherence of a single clinical practice guideline (22-24, 28, 30-35), while four reported the late post-implementation adherence of two clinical practice guidelines (25-27, 29). Seven studies had a single centre design (23, 28-30, 32-34) and seven studies evaluated sustainability in multiple centres (22, 24-27, 31, 35). Four out of six multiple centre studies evaluated the sustainability on multiple centre level (22, 26, 31, 35). Two out of six multiple centre studies evaluated the sustainability of professionals' adherence of two guidelines which were implemented in one centre each (24, 27).

284 Sustainability of changed behaviour

The level of professionals' adherence was fully sustained in seven out of eighteen evaluations (table 3, supplementary file 3). The adherence was not fully sustained in six evaluations and four evaluations showed mixed sustainability results in the LATE POST measurement compared to the EARLY POST measurement. In one study, the EARLY POST measurement was not executed, while the authors reported sustained results (28). After decreasing the sustainability level of professionals' adherence to 90% or higher, nine out of eighteen evaluations showed sustained results, three evaluations showed no sustained results, four evaluations showed mixed results. In two evaluations it was unclear whether the professionals' adherence had been sustained at a level 90% or higher.

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Five of the ten papers that reported about a single clinical practice guideline presented sustained professionals' adherence to clinical practice guidelines in the LATE POST measurement (22-24, 30, 34). One of these five papers evaluated the sustainability of a single clinical practice guideline in two centres (24). In both centres professionals' adherence had improved in the LATE POST measurement compared to the EARLY POST measurement. The four studies analysing the sustainability of two clinical practice guidelines showed mixed results. Two of these four studies (25, 29), presented the same level or improved adherence to one guideline and decreased adherence to the other guideline in the LATE POST measurement compared to the EARLY POST measurement. The other two of these four studies (26, 27) presented adherence results on guideline recommendation level and did not present overall adherence results on patient level. The adherence to the recommendations of the clinical practice guidelines showed decreased and improved levels in the LATE POST measurement compared to the EARLY POST measurement. In total, eight papers mentioned the term 'sustainability' in the conclusion (table 3) (22-28, 32). Five of these studies concluded to have sustained professionals' adherence in the late post-implementation phase (22-24, 28, 32), three out of eight

studies described to have a 'mixed pattern', 'small desired' or 'almost' sustained professionals'

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Table 3. Sustainability of professionals' adherence to clinical practice guidelines

Study ID	Authors' comments in terms of sustainability of adherence to the clinical practice guideline*	Sustained compared to early implementation results (100%) (yes/no)**	Sustained compared to early implementation results (90%) (yes/no)**
Ament (22)	"Adherence to the guideline recommendations was sustained in four early adopter hospitals"	yes	yes
Benenson (23)	"The observed pre pathway to post pathway differences were sustained over three years"	yes	yes
Cates (24)	(Centre 1 & 2) "our approach has brought about a <i>sustained</i> reduction in the use of antibiotics for children with acute otitis media, and after dissemination of our findings, similar results have been replicated at centre II using deferred prescribing of antibiotics for children who are not unduly ill"	yes	yes
Enriquez-Puga (25)	"There was a small change in the desired direction in the proportion of antidepressants prescribed according to guidelines that lasted for 24 months, although no change for antibiotics. A simple, group level educational outreach intervention, designed to take account of identified barriers to change, appears to have a small <i>sustained</i> effect on prescribing levels, but the effect is not consistent across different groups of drugs"	Guideline 1: no Guideline 2: yes	Guideline 1: no Guideline 2: yes
Forsner (26)	"This study suggested that the compliance to clinical guidelines, for treatment of depression and suicidal behaviour, was implemented and <i>sustained</i> over a two-year period after an active	Guideline 1: mixed	Guideline 1: mixed
Gerber (35)	implementation"	Guideline 2: mixed	Guideline 2: mixed
Higuchi (27)	(1)" The chart audit revealed that eleven nursing care indicators related to the asthma guideline recommendations showed a mixed pattern of sustainability"	Guideline 1: mixed	no Guideline 1: mixed
	(2) Not mentioned	Guideline 2: mixed	Guideline 2: mixed
Kelly (28)	"The study demonstrated a significant and <i>sustained</i> change in analgesia administration practices away from the intramuscular (IM) route in favour of the IV route."	na	na
Knops (29)	(1)Not mentioned	Guideline 1: yes	Guideline 1: yes
	(2)Not mentioned	Guideline 2: no	Guideline 2: no
Loszadi (30)	Not mentioned	yes	yes
Mclaws (31)	Not mentioned	no	yes
Stephan (32)	"One of the most important results of our intervention is its <i>sustained</i> impact. In particular, the frequency of catheter use decreased in the operating room not only immediately after guideline implementation, but also could be observed 2 years later."	no	yes
Wakefield (33)	Not mentioned	no	na
Williams (34)	Not mentioned	yes	yes
** The same level or i ***At least 90% of pro na: not applicable as mixed: The overall pro- recommendations we	nors of reviewed papers about the sustainability of adherence to the clinical practice guideline improved professionals' adherence was achieved years after implementation compared to early post-im- ofessionals' adherence was achieved years after implementation, compared to early post-implementation the early post-implementation results were not measured ofessionals' adherence was not presented, and both sustained and not sustained levels of professional are achieved in the late post-implementation phase compared to early post-implementation results.	on results (yes/no)	e guideline
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310 Risk of bias in included studies

- 311 All studies included in the present review had a high risk of bias, following the Downs and Black
- 312 assessment tool (20) (table 4, supplementary file 4).

Study ID Reporting Internal Internal Total External validity validity - bias validity confounding Ament (22) Unclear High High High High Benenson (23) Unclear High High High High Cates (24) High Unclear High High High Enriquez-Puga (25) Unclear High High Unclear High Forsner (26) Unclear High High Low High Gerber (35) Low High High High Low Higuchi (27) High High High High High Kelly (28) High High High High High Knops (29) High Low High High High Loszadi (30) Unclear High Unclear High High Mclaws (31) High Low Unclear High High Stephan (32) High High Unclear High High Wakefield (33) High High High High High Williams (34) High High Unclear High High High High Total High High High

Table 4. Results of the risk of bias assessment

313

314 DISCUSSION

315 Our review focused on the level of sustainability of implementation success in terms of professionals' 316 adherence. Also, this systematic review described the state of the art in sustainability research. This 317 systematic review identified fourteen studies, including eighteen evaluations that investigated the 318 sustainability of professionals' adherence to a clinical practice guideline more than one year after the 319 implementation was finished. Of eighteen analyses that focused on the extent of sustained 320 professionals' adherence to a clinical practice guideline, seven analyses revealed fully sustained 321 results. After decreasing the sustainability level of professionals' adherence to 90% or higher, nine out 322 of eighteen evaluations showed sustained results. The current review showed that the number of 323 sustainability studies is scarce and that the studies are heterogeneous with respect to their 324 methodology. Furthermore, almost no study analysed or reflected on the updates of the guideline in 325 the post-implementation phase. The results of this review suggest that updates of the clinical practice 326 guidelines may have led to a warranted decrease in the adherence to the original clinical practice 327 guideline.

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 In this systematic review, information was presented about how to search for sustainability evaluations, how sustainability research is defined and about the type and the methodological quality of studies that report on sustainability. As was confirmed in another systematic review (10), the sustainability studies showed to have limited methodological rigor. Two out of fourteen studies used an experimental design. The lack of identified studies in the current review suggests that most teams do not focus on the long-term performance effect of quality improvements (64). Due to the limited number of studies focusing on this subject, the heterogeneity in studies, suboptimal reporting by authors and the revealed methodological weaknesses, no strong conclusions can be drawn based on the presented sustainability results. As also shown in other research, most sustainability studies used a single-case study design by focusing on a single type of programme or performed the evaluation at a single centre level (65). The current review showed that in only two of the studies, a reference for the definition of sustainability was used. Other studies performed a sustainability evaluation without mentioning a definition. This shows the underdeveloped field of sustainability research. Also, a variety of timeframes to study the sustainability of professionals' adherence to clinical practice guidelines was revealed, varying from one and a half year to seven years following implementation.

Optimal adherence to a clinical practice guideline as determined during implementation is not always desired; for example, clinical experience and evidence may change. This systematic review included all research designs and seems to be the first review with respect to sustainability of professionals' adherence to clinical practice guidelines to date. Other reviews focused on healthcare from a broad perspective including multiple health care fields (10) or reviewed studies performed specifically in public health (6, 9). The sustainability of a health programme in public health may be influenced by other determinants than the sustainability of a clinical practice guideline in medical care. Also, the concept of the sustainability may differ between healthcare fields. For example, in public health sustainability of a health programme may be successfully sustained if health outcomes, e.g. changed lifestyle, are maintained and financial support is still available (6, 65). In medical care, the primary focus is on the quality and safety of care which is supposed to be captured in clinical practice guidelines. Due to the specific focus on clinical practice guidelines in the current review, mainly other studies were included compared to the existing sustainability reviews (6-10, 14).

359 Strengths and weaknesses

As yet, the term 'sustainability' is not consistently used for this area in the broader medical field, which presents a limitation to the electronic search strategy. The topic is not well indexed in electronic databases, and text word searches are prone to high recall and low specificity. However, it is likely that the use of a broad variety of search terms that covered sustainability, has downsized the number of relevant studies missed and is a strength of the review.

In this systematic review, sustainability was assessed as successful if performance in terms of
 professionals' adherence was fully maintained in the late post-implementation phase. This definition of

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sustainability may be too pragmatic as it could be undesirable to fully sustain the professionals' adherence in the late post-implementation phase. Therefore, a sensitivity analysis was performed to analyse the sustainability at a level of 90% or higher. However, as mentioned before, a limitation of the review is the high risk of bias of all studies included. The majority of the studies used a retrospective data collection method. Nevertheless, results were interpreted under consideration of risk of bias, and the assessments were also used for recommendations for further research by identifying elements of studies that can be improved in new studies. Also, the question is what the best method is for evaluating sustainability. For example, retrospective data may be desired to prevent a Hawthorne effect when studying routine practice.

The results of the current review show more studies with sustained professionals' adherence than might be expected without continuing efforts and support to promote the level of sustained adherence in the post-implementation phase. Possibly, studies with unfavourable results may not be published or unsuccessful implementation projects may not be evaluated, leading to an under-representation of the true amount of work carried out in the field (66, 67).

Sustainability of professionals' adherence may be influenced by the perceived quality of the guideline. However, we were not able to analyse the quality of the guidelines given the limited information in the manuscripts and the information on the Internet on the specific guidelines. More information about the quality of the guidelines in sustainability evaluations may be helpful to analyse the sustainability of the guideline. Also, the potential effect of the specific implementation strategies was not analysed as part of the systematic review. Professionals' adherence is an outcome measure used in implementation science and it captures the behaviour change as a result of implementation strategies. The type of implementation strategy may have had an effect on the sustainability of the implementation results. The studies included used various implementation strategies and implemented different clinical practices guidelines.

394 Implications for practice

The current review showed that the level of the sustainability of professionals' adherence to clinical practice guidelines varies on case study level and drops in more than half of the studies. Due to the lack of sustainability research we think that sustainability failure as presented in this study is an underestimation. Unfortunately, implementation projects are primarily focused on short-term actions and short-term effect (64).

401 Future research

This review complements the existing sustainability research by focussing on sustained professionals' adherence in medical practice. The current review showed that not many studies reported data on the sustainability of professionals' adherence to clinical practice guidelines. Also, no strong conclusions can be drawn due to the high risk for bias and the heterogeneity of the studies. As shown in previous

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406 research, structural methods for sustainability evaluations are lacking (10, 68). Furthermore, future 407 implementation and sustainability evaluations may include information about the quality of the clinical 408 practice guideline, such as described in the AGREE instrument (69). More sustainability evaluation 409 research and methodological guidance is needed to make future sustainability research more robust 410 and generalizable and may be helpful in creating a general sustainability language.

412 CONCLUSION

This systematic review identified, reported and analysed studies that evaluated the level of sustainability of professionals' adherence to guideline recommendations in medical practice more than one year following the cessation of the implementation project. 2) Seven out of eighteen evaluations showed sustained professionals' adherence on average 2.6 years after implementation. 1) Due to the limited number and the lack of methodological quality of the identified studies, no firm conclusion about the sustainability of professionals' adherence to guideline recommendations in medical practice can be drawn. More sustainability evaluations, methodological sustainability studies and reviews are needed in order to develop a general framework for sustainability measurement and to facilitate uniform language and communication within the sustainability science.

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JM, CD, TvW and JK. S.A. was responsible for the draft of the manuscript and all authors were also
involved in editing the manuscript. All authors have given final approval of the version to be published.
All authors are accountable for all aspects of the work in ensuring that questions related to the
accuracy or integrity of any part of the work are appropriately investigated and resolved. SA is
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care at Maastricht University and founded Kleijnen Systematic Reviews (KSR) Ltd in 2005. KSR is an independent research company that produces and disseminates systematic reviews, cost effectiveness analyses and health technology assessments of research evidence in health care. All authors read and approved the final manuscript.

Ethical approval: Not required.

Transparency: SA (the manuscript's guarantor) affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Data sharing statement: Unpublished study data, such as the search strategies for the other databases, are available upon request to the corresponding author.

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465	References
466	1. Graham R MM, Wolman DM, Greenfield S, Steinberg E. Clinical practice guidelines we can
467	trust. Washington (DC): National Academies Press; 2011.
468	2. Thomas LH, McColl E, Cullum N, Rousseau N, Soutter J, Steen N. Effect of clinical guidelines in
469	nursing, midwifery, and the therapies: a systematic review of evaluations. Quality in Health Care.
470	1998;7(4):183-91.

3. Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Ramsay CR, Vale L, et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. Health technology assessment (Winchester, England). 2004;8(6):iii-iv, 1-72.

Protected by copyright, including for uses related to text and data mining, Al training, and similar technologies

1		
2 3	474	4. Ajzen I. The Theory of Planned Behavior. Organizational Behavior and Human Decision
4	475	Processes. 1991;50(2):179-211.
5	476	5. Pluye P, Potvin L, Denis JL, Pelletier J. Program sustainability: focus on organizational
6	477	routines. Health Promot Int. 2004;19(4):489-500.
7	478	6. Gruen RL, Elliott JH, Nolan ML, Lawton PD, Parkhill A, McLaren CJ, et al. Sustainability
8	479	science: an integrated approach for health-programme planning. Lancet. 2008;372(9649):1579-89.
9	480	7. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in
10	481	service organizations: systematic review and recommendations. Milbank Q. 2004;82(4):581-629.
11	482	8. Shediac-Rizkallah MC, Bone LR. Planning for the sustainability of community-based health
12	483	programs: conceptual frameworks and future directions for research, practice and policy. Health
13 14	484	Educ Res. 1998;13(1):87-108.
14	485	9. Scheirer MA. Is Sustainability Possible? A Review and Commentary on Empirical Studies of
16	486	Program Sustainability. American Journal of Evaluation. 2005;26(3):27.
17	487	10. Wiltsey Stirman S, Kimberly J, Cook N, Calloway A, Castro F, Charns M. The sustainability of
18	488	new programs and innovations: a review of the empirical literature and recommendations for future
19	489	research. Implementation Science. 2012;7(1):17.
20	490	11. NHS. Sustainability and its relationship with spread and adoption. 2007; Coventry. Available
21	491	from: http://www.clahrc-northwestlondon.nihr.ac.uk/inc/files/documents/improvement-
22	492	methodology-resources-
23	493	section/ilg 1.7 substainability and its relationship with spread and adoption.pdf.
24 25	494	12. Ament SM, Gillissen F, Maessen JM, Dirksen CD, van der Weijden T, von Meyenfeldt MF.
25 26	495	Sustainability of healthcare innovations (SUSHI): long term effects of two implemented surgical care
20 27	496	programmes (protocol). BMC health services research. 2012;12:423.
28	497	13. Adams AS, Soumerai SB, Lomas J, Ross-Degnan D. Evidence of self-report bias in assessing
29	498	adherence to guidelines. International journal for quality in health care : journal of the International
30	499	Society for Quality in Health Care / ISQua. 1999;11(3):187-92.
31	500	14. Buchanan D, Fitzgerald L, Ketley D, Gollop R, Jones JL, Lamont SS, et al. No going back: A
32	501	review of the literature on sustaining organizational change. International Journal of Management
33	502	Reviews. 2005;7(3):189-205.
34	503	15. Fleiszer AR, Semenic SE, Ritchie JA, Richer M-C, Denis J-L. The sustainability of healthcare
35 36	504	innovations: a concept analysis. Journal of Advanced Nursing. 2015;71(7):1484-98.
30 37	505	16. Proctor E, Luke D, Calhoun A, McMillen C, Brownson R, McCrary S, et al. Sustainability of
38	506	evidence-based healthcare: research agenda, methodological advances, and infrastructure support.
39	507	Implementation Science : IS. 2015;10.
40	508	17. Chambers D, Glasgow R, Stange K. The dynamic sustainability framework: addressing the
41	509	paradox of sustainment amid ongoing change. Implementation Science. 2013;8(1):117.
42	510	18. Ilott I, Gerrish K, Pownall S, Eltringham S, Booth A. Exploring scale-up, spread, and
43	511	sustainability: an instrumental case study tracing an innovation to enhance dysphagia care.
44	512	Implementation Science. 2013;8(1):128.
45 40	513	19. Cochrane Effective Practice and Organisation of Care Review Group. Data Collection
46 47	514	Checklist. University of Ottawa: Institute of Population Health; 2011.
47 48	515	20. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the
40 49	516	methodological quality both of randomised and non-randomised studies of health care interventions.
49 50	517	Journal of Epidemiology and Community Health. 1998;52(6):377-84.
51	518	21. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews
52	519	and meta-analyses: the PRISMA statement. PLoS medicine. 2009;6(7):e1000097.
53	520	22. Ament SM, Gillissen F, Maessen JM, Dirksen CD, Bell AV, Vissers YL, et al. Sustainability of
54	521	short stay after breast cancer surgery in early adopter hospitals. Breast (Edinburgh, Scotland). 2014.
55	522	23. Benenson R, Magalski A, Cavanaugh S, Williams E. Effects of a pneumonia clinical pathway on
56	523	time to antibiotic treatment, length of stay, and mortality. Academic Emergency Medicine.
57 59	524	1999;6(12):1243-8.
58 59		
59 60		21
00		Z 1

1		
2		
3	525	24. Cates CJ. Delayed antibiotics for children with acute otitis media: Is practice change
4	526	sustainable? Evidence-Based Medicine. 2009;14(1):2-3.
5	527	25. Enriquez-Puga A, Baker R, Paul S, Villoro-Valdes R. Effect of educational outreach on general
6	528	practice prescribing of antibiotics and antidepressants: A two-year randomised controlled trialal.
7	529	Scandinavian Journal of Primary Health Care. 2009;27(4):195-201.
8 9	530	26. Forsner T, Wistedt A, Brommels M, Janszky I, de Leon A, Forsell Y. Supported local
9 10	531	implementation of clinical guidelines in psychiatry: a two-year follow-up. Implementation Science.
10	532	2010;5(1):4.
12	533	27. Higuchi KS, Davies BL, Edwards N, Ploeg J, Virani T. Implementation of clinical guidelines for
13	534	adults with asthma and diabetes: A three-year follow-up evaluation of nursing care. Journal of
14	535	Clinical Nursing. 2011;20(9-10):1329-38.
15	536	28. Kelly AM. Nurse-managed analgesia for renal colic pain in the emergency department.
16	537	Australian health review : a publication of the Australian Hospital Association. 2000;23(2):185-9.
17	538	29. Knops AM, Storm-Versloot MN, Mank APM, Ubbink DT, Vermeulen H, Bossuyt PMM, et al.
18	539	Factors influencing long-term adherence to two previously implemented hospital guidelines.
19	540	International Journal for Quality in Health Care. 2010;22(5):421-9.
20	541	30. Lozsadi DA, Peters G, Sadik HY, Kellett MW, Fox SH, Smith DF. Prevention of osteoporosis in
21	542	glucocorticoid-treated neurology patients. Clinical Neurology and Neurosurgery. 2006;108(2):157-62.
22	543	31. McLaws ML, Pantle AC, Fitzpatrick KR, Hughes CF. Improvements in hand hygiene across New
23	544 544	South Wales public hospitals: clean hands save lives, part III. The Medical journal of Australia.
24	545	2009;191(8 Suppl):S18-24.
25		
26	546	32. Stephan F, Sax H, Wachsmuth M, Hoffmeyer P, Clergue F, Pittet D. Reduction of urinary tract
27	547	infection and antibiotic use after surgery: A controlled, prospective, before-after intervention study.
28	548	Clinical Infectious Diseases. 2006;42(11):1544-51.
29	549	33. Wakefield B, Johnson JA, Kron-Chalupa J, Paulsen L. A research-based guideline for
30	550	appropriate use of transdermal fentanyl to treat chronic pain. Oncology nursing forum.
31	551	1998;25(9):1505-13.
32	552	34. Williams A, Adams EJ, Bolderson J, Tincello DG, Richmond DH. Effect of a new guideline on
33	553	outcome following third-degree perineal tears: results of a 3-year audit. International Urogynecology
34	554	Journal. 2003;14(6):385-9.
35	555	35. Gerber JS, Prasad PA, Fiks AG, et al. DUrability of benefits of an outpatient antimicrobial
36 37	556	stewardship intervention after discontinuation of audit and feedback. Jama. 2014;312(23):2569-70.
38	557	36. de Kok M. Costs and effects of implementation of a short admission programme following
39	558	breast cancer surgery in the Netherlands. Rotterdam: Maastricht University; 2010.
40	559	37. Ament SMC, De Kok M., Van de Velde C.J.H., Roukema J.A., Bell A.V.R.J., Van der Ent FW, Van
40	560	der Weijden T., Von Meyenfeldt M.F., Dirksen C.D. Calculating implementation costs using a
42	561	structured method: implementation of a short stay programme for breast cancer surgery. 2014.
43	562	38. Mank A, Semin-Goossens A, Lelie J, Bakker P, Vos R. Monitoring hyperhydration during high-
44	563	dose chemotherapy: body weight or fluid balance? Acta haematologica. 2003;109(4):163-8.
45	564	39. Storm-Versloot MN, Knops AM, Ubbink DT, Goossens A, Legemate DA, Vermeulen H. Long-
46	565	term adherence to a local guideline on postoperative body temperature measurement: mixed
47	566	methods analysis. Journal of evaluation in clinical practice. 2012;18(4):841-7.
48	567	• • • • • •
49		
50	568	hand hygiene behaviour in hospitals: clean hands save lives, part I. Med J Aust. 2009;191(8 Suppl):S8-
51	569	
52	570	41. Gerber JS, Prasad PA, Fiks AG, Localio AR, Grundmeier RW, Bell LM, et al. Effect of an
53	571	outpatient antimicrobial stewardship intervention on broad-spectrum antibiotic prescribing by
54	572	primary care pediatricians: a randomized trial. Jama. 2013;309(22):2345-52.
55	573	42. Nationaal Borstkanker Overleg Nederland. NABON-Nota, Handboek organisatie mammazorg
56	574	Amsterdam2008. Available from:
57	575	http://www.oncoline.nl/uploaded/docs/mammacarcinoom/NABON nota 2008.pdf.
58		
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ker Overleg Nederland. Richtlijn Mammacarcinoom, landelijke richtlijn	: firs
uploads/ a/Gk/ aGkhzjRsgiYhbhbFWFETQ/Mammacarcinoom2012.pdf. ss JB, Jr., Campbell GD, Fein AM, Grossman RF, Mandell LA, et al. anagement of adults with community-acquired pneumonia: diagnosis, d initial antimicrobial therapy. American Thoracic Society. Medical Section ciation. The American review of respiratory disease. 1993;148(5):1418-26. andell LA, Anzueto A, Bass JB, Broughton WA, Campbell GD, et al. ment of adults with community-acquired pneumonia. Diagnosis,	BMJ Open: first published as 10.1136/bmjopen-2015-008073 on 29 Protected by copyright, including f
imicrobial therapy, and prevention. American journal of respiratory and .;163(7):1730-54.	/bmjc
erink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, et al. Infectious a/American Thoracic Society Consensus Guidelines on the Management of monia in Adults. Clinical Infectious Diseases. 2007;44(Supplement 2):S27-	.1136/bmjopen-2015-008073 on 29 December 2015. Downloac Enseignement Superie Protected by copyright, including for uses related to text and
Practice at NICE (UK). Respiratory Tract Infections. Antibiotic Prescribing: or Self-Limiting Respiratory Tract Infections in Adults and Children in onal Institute for Health and Clinical Excellence (UK); 2008. narbete. Regionalt vårdprogram. Vård av suicidnära patienter. Stockholm	08073 on 29 t, including
) Dec
th Authority. Leicestershire evidence based guidelines for the ression. 2000.	embe Ensei ses ro
Agency. Management of infection guidance for primary care for otation. London: HPA2005.	r 201: gnerr elated
r health and care excellence (NICE). Depression in adults: The treatment ssion in adults. 2004. narbete. Regionalt vårdprogram för depressionssjukdomar inkl. mano-	December 2015. Downloaded Enseignement Superieur for uses related to text and da
In Stockholm County Council, 2003. In CL, Shah SS, Alverson B, Carter ER, Harrison C, et al. The management of monia in infants and children older than 3 months of age: clinical practice Infectious Diseases Society and the Infectious Diseases Society of America. : an official publication of the Infectious Diseases Society of America.	led from h ur (ABES) data minii
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Association of Ontario, RNAO. Reducing Foot Complications for People 04.	pen.br
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Association of Ontario, RNAO. Reducing Foot Complications for people [updated 2007]. Available from: <u>http://rnao.ca/sites/rnao-</u> <u>etes_Updated.pdf</u> . ment guideline panel. Acute pain management: Operative or medical nical practice guideline. Washington DC: US Department of Health and	ttp://bmjopen.bmj.com/ on June 13, 2025 a ng, Al training, and similar technologies.
m-Versloot MN, Goossens A, Speelman P, Legemate DA. Diagnostic erative body temperature measurements. Clinical infectious diseases : an ifectious Diseases Society of America. 2005;40(10):1404-10. osis Society. Guidance on the prevention and management of eoporosis. Bath: NOS, 1998.	t <mark>tp://bmjopen.bmj.com/</mark> on June 13, 2025 at Agence Bibliographique de l ng, Al training, and similar technologies.
23	vhique
only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	e de l

43. Nationaal Borstkank 2012. Available from: http://www.heelkunde.nl/u 44. Niederman MS, Bass Guidelines for the initial man assessment of severity, and of the American Lung Associ 45. Niederman MS, Mai Guidelines for the managem assessment of severity, anti-critical care medicine. 2001; 46. Mandell LA, Wunde Diseases Society of America, **Community-Acquired Pneun** S72. 47. Centre for Clinical P Prescribing of Antibiotics for Primary Care: London: Natio 48. Medicinskt program County Council, 2002. 49. Leicestershire Healt management of major depre 50. Health Protection A consultation and local adapt 51. National Institue for and management of depress 52. Medicinskt program depressiv sjukdom. Stockho 53. Bradley JS, Byington community-acquired pneum guidelines by the Pediatric II Clinical infectious diseases : 2011;53(7):e25-76. 54. Registered Nurses' A Toronto: 2002a. 55. Registered Nurses' A with Diabetes. Toronto: 200 56. Registered Nurses' A Promoting Control of Asthm http://rnao.ca/sites/rnao-ca Promoting Control of Ast 57. Registered Nurses' A with Diabetes Toronto2004 ca/files/Foot Compl Diabet 58. Acute pain manager procedures and trauma: Clir Human Services., 1992. 59. Vermeulen H, Storm accuracy of routine postope official publication of the Inf 60. National Osteoporo corticosteroid induced osteo

Protected by copyright, including for uses related to text and

data mining, AI training, and similar technologies

BMJ Open

61. World Health Organization, WHO. guidelines on hand hygiene in health care (advanced draft): a summary. Clean hands are safer hands. Geneva: WHO, 2005. Norton JA BD, Bollinger RR, et al., . Surgery: basic science and clinical evidence. 2nd ed. New 62. York: Springer-Verlag; 2001. Malouf AJ, Norton CS, Engel AF, Nicholls RJ, Kamm MA. Long-term results of overlapping 63. anterior anal-sphincter repair for obstetric trauma. Lancet. 2000;355(9200):260-5. 64. Øvretveit J, Bate P, Cleary P, Cretin S, Gustafson D, McInnes K, et al. Quality collaboratives: lessons from research. Quality and Safety in Health Care. 2002;11(4):345-51. 65. Schell S, Luke D, Schooley M, Elliott M, Herbers S, Mueller N, et al. Public health program capacity for sustainability: a new framework. Implementation Science. 2013;8(1):15. Hopewell S, Loudon K, Clarke MJ, Oxman AD, Dickersin K. Publication bias in clinical trials due 66. to statistical significance or direction of trial results. The Cochrane database of systematic reviews. 2009(1):MR000006. Easterbrook PJ, Berlin JA, Gopalan R, Matthews DR. Publication bias in clinical research. 67. Lancet. 1991;337(8746):867-72. 68. Tricco AC, Cogo E, Ashoor H, Perrier L, McKibbon KA, Grimshaw JM, et al. Sustainability of knowledge translation interventions in healthcare decision-making: protocol for a scoping review. BMJ open. 2013:3(5). rent an. tice guidelin. 69. AGREE Collaboration. Development and validation of an international appraisal instrument for assessing the quality of clinical practice guidelines: the AGREE project. Quality & safety in health care. 2003;12(1):18-23.

651	Figure Legends	
652	Table 1	Characteristics of the studies included
653	Table 2	Implementation strategies as described by the authors
654	Table 3	Sustainability of professionals' adherence to clinical practice guidelines
655	Table 4	Results of the risk of bias assessment
656	Figure 1	PRISMA Flow Diagram
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659	Supplementary files	
660	Supplementary file 1	Electronic search strategy for MEDLINE (OvidSP)
661	Supplementary file 2	Excluded articles based on full-text selection (n=171) (detailed table)
662 663	Supplementary file 3	Sustainability of professionals' adherence to clinical practice guidelines (detailed table)
664	Supplementary file 4	Risk of bias using the Downs and Black checklist (detailed table)
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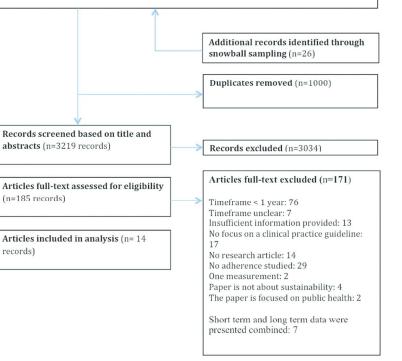


Records identified through electronic database search (n=4193)

March 17, 2014 MEDLINE (n=1329), Embase (n=2298), Cochrane (n=81), CINAHL (n=126), GIN (n=0) (n=3830)

March - June 27, 2014: MEDLINE (n=8), Embase (n=99), Cochrane (n=0), CINAHL (n=13), GIN (n=0) (n=120)

June 27, 2014 – August 4, 2015: MEDLINE (n=139), Embase (n=99), Cochrane (n=0), CINAHL (n=5), GIN (n=0) (n=243)



PRISMA Flow Diagram 91x127mm (300 x 300 DPI)

1 2 3	Supplementary file 1. Electronic search strategy for MEDLINE (OvidSP)				
4	Database: Ovid MEDLINE <1946 to February Week 4 2014>				
5 6	Date searched: 14.03.2014				
7	Records found: 1329				
8	Sustainability facet				
9 10 11	 (adoption adj2 (longitudinal or long term or longterm)).ti,ab,ot. (64) ((continued or continuation) adj2 (adherence or compliance or effect or effects or effectiveness or impact\$ or intervention\$ or innovation\$ or program\$)).ti,ab,ot. (1823) 				
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13 14	 4 (diffusion adj2 (longitudinal or long term or longterm)).ti,ab,ot. (188) 				
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49 50	program\$ or post-implement\$ or success\$ or vitality)).ti,ab,ot. (15804)				
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Animal-only study exclusion

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1 2 3	Supplementary file 2. Excluded articles based on full-text selection (n=171)	•	an-2015-008073 (copyright, inclu	
4	Paper		dir 9	Exclusion reason
5 6 7 8 9	R. Adsit, D. Fraser, L. Redmond, S. Smith, and M. Fiore, 'Changing Clinical Practice, Helping Peo Outreach Model', Wisconsin Medical Journal, 104 (2005), 32-36.	ople Quit: The Wiscof	Spin Sessation Constant December Ensein	No adherence studied
10 11 12 13 14	M.L. Affronti, S.M. Schneider, J.E. Herndon, S. Schlundt, H.S. Friedman, 'Adherence to antiemeti glioma: a quality improvement project to translate evidence into practice', Supportive Care in Can	•		Timeframe < 1 year
15 16 17 18 19	B. Allegranzi, A. Gayet-Ageron, N. Damani, L. Bengaly, M. L. McLaws, M. L. Moro, Z. Memish, O. and D. Pittet, 'Global Implementation of Who's Multimodal Strategy for Improvement of Hand Hyg Lancet Infectious Diseases, 13 (2013), 843-51.			
20 21 22 23 24	J. C. Alonso, 'A Figo Project in Uruguay to Prevent Maternal Death Due to Unsafe Termination of Medicine, 41 (2013).	Pregnancy', Journal	inerinatal Bri Perinatal Al trainipen	Insufficient information provided
25 26 27 28	E. Alp, D. Haverkate, and A. Voss, 'Hand Hygiene among Laboratory Workers', Infection Control 80.	& Hospital Epidemiol	1. agy, 27 (2006), 978- 1. agy, 278- 1. ag	Timeframe < 1 year
29 30 31 32 33	H. K. Amdany, and M. McMillan, 'Metronidazole Intravenous Formulation Use in in-Patients in Kap Practice Implementation Project', JBI Database of Systematic Reviews and Implementation Repo			Timeframe < 1 year
34 35 36 37 38 39 40 41 42 43	R. S. Bailie, D. Si, G. W. Robinson, S. J. Togni, and P. H. N. d'Abbs, 'A Multifaceted Health-Servic Communities: 3-Year Follow-up of the Impact on Diabetes Care', Medical Journal of Australia, 18		noteAboriginal Agence Bibliographique	Timeframe unclear
44 45 46 47	For peer review only - http://bmjopen.bmj.com/site	/about/guidelines.x		

d by copyrig BMJ Open	
R. S. Bailie, S. J. Togni, D. Si, G. Robinson, and P. H. N. D'Abbs, 'Preventive Medical Care in Remote Aboriginal Communities in the Northern Territory: A Follow-up Study of the Impact of Clinical Guidelines, Computerised Recall and Reminder Systems, and Audit and Feedback', BMC Health Services Research, 3 (2003), 1-13.	Timeframe unclear
Anonymous, 'Report: Cpoe Adoption a Long-Term Process', Healthcare Benchmarks & Quality Improvement, 10 (2003), 105-7.	No research article
M. B. Goetz, T. Hoang, S. R. Henry, H. Knapp, H. D. Anaya, A. L. Gifford, and S. M. Asch, 'Evaluation of the Sustainability of an Intervention to Increase Hiv Testing', J Gen Intern Med, 24 (2009), 1275-80.	No focus on a clinical practice guideline
E. L. Mawdsley, S. Garcia-Houchins, and S. G. Weber, 'Back to Basics: Four Years of Sustained Improvement in Implante at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission journal on quality and patient safety / Joint Commission at a University Hospital', Joint Commission at a University Hospital'	No focus on a clinical practice guideline
R. S. Bailie, G. Robinson, S. N. Kondalsamy-Chennakesavan, S. Halpin, and Z. Wang, 'Investigating the Sustainability of outcomes in a Chronic Disease Treatment Programme', Soc Sci Med, 63 (2006), 1661-70.	Timeframe < 1 year
F. E. Babl, D. Krieser, J. Belousoff, and T. Theophilos, 'Evaluation of a Paediatric Procedural Sedation Training and Crock Programme: Sustainability of Change', Emerg Med J, 27 (2010), 577-81.	Timeframe < 1 year
P. A. Bampton, J. J. Sandford, and G. P. Young, 'Achieving Long-Term Compliance with Colonoscopic Surveillance Guidelines for Patients at Increased Risk of Colorectal Cancer in Australia', International Journal of Clinical Practice, 61 (2007), 510-13.	Timeframe < 1 year
R.S. Bhatia, D.M. Dudzinski, C.E. Milford, M.H. Picard, R.B. Weiner "Educational intervention to reduce inappropriate transformatic echocardiograms: the need for sustained intervention." Echocardiography 31(8) (2014): 916-923.	Timeframe < 1 year
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtm	

Page 31	of 78	BMJ Open	ijopen-201 d by copyr	
1 2 3 4 5	D. Berild, T. G. Abrahamsen, S. Andresen, E. Bjorlow, O. Haug, I. M. Kosser Pyasetskaya, S. H. Ringertz, and G. A. Sysenko, 'A Controlled Intervention S Hospital', International Journal of Antimicrobial Agents, 31 (2008), 478-83.		ight. ko <u>i</u> m	Timeframe < 1 year
6 7 8 9 10	M. T. Bigham, R. Amato, P. Bondurrant, J. Fridriksson, C. D. Krawczeski, J. F. J. Brilli, 'Ventilator-Associated Pneumonia in the Pediatric Intensive Care Un Sustainable Solution', Journal of Pediatrics, 154 (2009), 582-87.e2.	-	E 0	d R. Short term and long term data were presented combined
11 12 13 14 15	M. Fleuren, E. Dusseldorp, S. van den Bergh, H. Vlek, J. Wildschut, E. van d Guideline for Back Pain: Effect on Unnecessary Referrals', Int J Qual Health	den Akker, and D. Wijkel, 'Implementation Care, 22 (2010), 415-20.	edformed C annent Superior to text and	are No focus on a clinical practice guideline
16 17 18 19 20	K. Blanchet, and P. James, 'Can International Health Programmes Be Sustal Care Interventions in Ghana', BMC Health Serv Res, 14 (2014), 77.	ined after the End of International Fundi	1 ddee Case of ngta mining ngta mining	Eye No focus on a clinical practice guideline
21 22 23 24	P. G. Teixeira, K. Inaba, J. Dubose, N. Melo, M. Bass, H. Belzberg, and D. D Using a Daily Quality Rounds Checklist: Two-Year Prospective Analysis of S Trauma and Acute Care Surgery, 75 (2013), 717-21.			
25 26 27 28 29	L. Bowers, C. Berry-Caban, and R. Munson, 'Implementing Process Improve Practice Guidelines in a Military Treatment Facility', Journal of the American		0 0	cal Insufficient information provided
30 31 32 33 34	C. C. Bowman, E. J. Sobo, S. M. Asch, and A. L. Gifford, 'Measuring Persiste (2008), 21.	ence of Implementation: Queri Series', Ir	chapentent Sci, 3 malentent Sci, 3 ogies.	No research article
35 36 37 38 39 40 41 42	C. Brand, F. Landgren, A. Hutchinson, C. Jones, L. MacGregor, and D. Cam Effective Early Implementation', Internal Medicine Journal, 35 (2005), 162-69	• •	at Aurability ers togence Bibliographique	after One measurement
43 44 45 46 47	For peer review only - http://bn	njopen.bmj.com/site/about/guidelines.	nique Activitation Activitation	

BMJ Open B. D. Brazzell, 'Improving High Hand-Hygiene Compliance and Reducing Healthcareassociated Infection in Eight Nursing Bnits',	
B. D. Brazzell, 'Improving High Hand-Hygiene Compliance and Reducing Healthcareassociated Infection in Eight Nursing Bnits', American Journal of Infection Control, 1) (2014), S25-S26.	Timeframe < 1 year
A. S. Brent, W. M. Rahman, L. L. Knarr, J. A. Harrison, K. L. Kearns, and D. S. Lindstrom, 'Reducing Cycle Times in Pediatric Emergency Care, 25 (2009), 307-11.	No adherence studied
D. L. Whitford, S. H. Roberts, and S. Griffin, 'Sustainability and Effectiveness of Comprehensive Diabetes Care to a D& Reference Population', Diabet Med, 21 (2004), 1221-8.	Timeframe unclear
B. L. Carter, 'Blood Pressure Control-Implementing a Team Approach', US Cardiology, 8 (2011), 108-13.	No research article
Ali A. Cheema, Annette M. Scott, Karen J. Shambaugh, Jacqueline N. Shaffer-Hartman, Ronald E. Dechert, Susan M. Hieber, John W. Gosbee, and Matthew F. Niedner, 'Rebound in Ventilator-Associated Pneumonia Rates During a Prevention Checklist Vaspout Period', BMJ Quality & Safety, 20 (2011), 811-17.	Short term and long term data were presented combined
Y. C. Chen, W. H. Sheng, J. T. Wang, S. C. Chang, H. C. Lin, K. L. Tien, L. Y. Hsu, and K. S. Tsai, 'Effectiveness and Lynitations of Hand Hygiene Promotion on Decreasing Healthcare-Associated Infections', PLoS ONE [Electronic Resource], 6 (2011), e273632	Timeframe < 1 year
L. L. Chlan, J. L. Guttormson, and K. Savik, 'Tailoring a Treatment Fidelity Framework for an Intensive Care Unit Clinical Tral', Nursing Research, 60 (2011), 348-53.	Timeframe < 1 year
B.R. Cooper, B.K. Bumbarger, J.E. Moore, "Sustaining Evidence-Based Prevention Programs: Correlates in a Large-Scale Dissemination Initiative." Prevention Science 16 (2015): 145-157.	The paper is focused on public health
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtm	

Page 33	of 78 BMJ Open	d by copyri	iopen-2	
1 2 3 4 5	B. Crawford, M. Skeath, and A. Whippy, 'Kaiser Permanente Northern California Sepsis Mortality Reduction Initiative (2012).	gh	94 5- 00 20 20 20 20 20 20 20 20 20 20 20 20	Timeframe < 1 year
6 7 8 9 10	J. D. Crews, E. Whaley, D. Syblik, and J. Starke, 'Sustained Improvement in Hand Hygiene at a Children's Hospital', Hospital Epidemiology, 34 (2013), 751-53.	torect foreuses rela	9 Don Control and Control and Ber 2	Timeframe < 1 year
11 12 13 14 15	S. B. DeMauro, E. Douglas, K. Karp, B. Schmidt, J. Patel, A. Kronberger, R. Scarboro, and M. Posencheg, 'Improvir Management for Very Preterm Infants', Pediatrics, 132 (2013), e1018-e25.	entent Superio ted to text and g	9 Sery Room Down Down Down Down Down	Short term and long term data were presented combined
16 17 18 19 20	S. Deuster, I. Roten, and S. Muehlebach, 'Implementation of Treatment Guidelines to Support Judicious Use of Antil Journal of Clinical Pharmacy and Therapeutics, 35 (2010), 71-78.	euto(ABES) . dogta mining	dearapy', from htt	Timeframe < 1 year
20 21 22 23 24 25	M. A. Doyle, S. Brez, S. Sicoli, F. De Sousa, E. Keely, and J. C. Malcom, 'Using Standardized Insulin Orders to Impr a Tertiary Care Centre', Canadian Journal of Diabetes, 38 (2014), 118-25.	, A ∳training,	erient Safety in	Insufficient information provided
26 27 28 29	J.M. Edmunds, K.L. Read, V.A. Ringle, D.M. Brodman, P.C. Kendall, R.S. Beidas, "Sustaining clinician penetration, knowledge in cognitive-behavioral therapy for youth anxiety." Implement Sci 9 (2014): 89.	andud attisimilar te	and Solution	No adherence studied
30 31 32 33 34	K. Ellingson, R. R. Muder, R. Jain, D. Kleinbaum, P. J. Feng, C. Cunningham, C. Squier, J. Lloyd, J. Edwards, V. Ge 'Sustained Reduction in the Clinical Incidence of Methicillin-Resistant Staphylococcus Aureus Colonization or Infecti Multifaceted Infection Control Intervention', Infect Control Hosp Epidemiol, 32 (2011), 1-8.	on <mark>g</mark> Ass		
35 36 37 38 39 40 41 42 43	J. N. Epstein, J. M. Langberg, P. K. Lichtenstein, R. C. Kolb, and L. J. Stark, 'Sustained Improvement in Pediatrician Behaviors in the Context of a Community-Based Quality Improvement Initiative', Children's Health Care, 39 (2010), For peer review only - http://bmjopen.bmj.com/site/about/guidelines	296-31	en.	Timeframe < 1 year
44 45 46 47	For peer review only - http://bmjopen.bmj.com/site/about/guidelines	.xhtm	ue de l	

d by copyrig BMJ Open	
K. J. Evans, J. Thompson, S. E. Spratt, L. F. Lien, and A. Vorderstrasse, 'The Implementation and Evaluation of an Evidence-Based Protocol to Treat Diabetic Ketoacidosis: A Quality Improvement Study', Adv Emerg Nurs J, 36 (2014), 189-98.	Timeframe < 1 year
M. Fakhry, G. B. Hanna, O. Anderson, A. Holmes, and D. Nathwani, 'Effectiveness of an Audible Reminder on Hand Hygie e Adherence', American Journal of Infection Control, 40 (2012), 320-23.	Timeframe < 1 year
M. G. Fakih, K. Jones, J. E. Rey, R. Takla, S. Szpunar, K. Brown, A. Boelstler, and L. Saravolatz, 'Peripheral Venous Candidate of the Emergency Department: Education and Feedback Lead to Marked Improvements', American Journal of Infection Control of 1 (2013), 531- 6.	
M. Bunik, M. J. Federico, B. Beaty, M. Rannie, J. T. Olin, and A. Kempe, 'Quality Improvement for Asthma Care within Teaching Clinic', Academic Pediatrics, 11 (2011), 58-65.	Timeframe < 1 year
B. R. Ferrell, and R. Virani, 'Institutional Commitment to Improved Pain Management: Sustaining the Effort', Journal of the maceutical Care in Pain and Symptom Control, 6 (1998), 43-55.	No adherence studied
G. T. Feyissa, J. S. Gomersall, and S. Robertson-Malt, 'Compliance to Hand Hygiene Practice among Nurses in Jimm Specialized Hospital in Ethiopia: A Best Practice Implementation Project', JBI Database of Systematic Reviews and Implementation Reports, 12 (2014), 318-37.	Timeframe < 1 year
A. M. Finucane, B. Stevenson, R. Moyes, D. Oxenham, and S. A. Murray, 'Improving End-of-Life Care in Nursing Homes and Evaluation of an Intervention to Sustain Quality of Care', Palliative Medicine, 27 (2013), 772-78.	Timeframe < 1 year
A. Fisher, 'How Nhs Trusts Are Tackling Healthcare-Associated Infections', Nursing management (Harrow, London, Englare 1994), 16 (2010), 26-27.	No research article
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmb	

Page 35	of 78	BN	IJ Open	ijopen-201 I by copyr	
1 2 3 4 5	E. J. Gallagher, and S. W. Trotzky, 'Sustained Films', Journal of Emergency Medicine, 16 (1		rdering of Emergency Departme	igh	No focus on a clinical practice guideline
6 7 8 9 10	G. C. Fonarow, M. J. Reeves, E. E. Smith, J. Stroke Steering Committee, and Investigator Stroke and Transient Ischemic Attack Admiss (2010), 291-302.	s, 'Characteristics, Performance Me	asures, and in-Hospital Outcom	ies of ត្តិទ្ធាម្ន័irst One Milli	
11 12 13 14 15	D. Fonda, J. Cook, V. Sandler, and M. Bailey Journal of Australia, 184 (2006), 379-82.	, 'Sustained Reduction in Serious F	all-Related Injuries in Older Peo	ple in Hospital', Medical of the Spital', Medical of the Superior t and Superior	No focus on a clinical practice guideline
16 17 18 19 20	S. P. Ford, M. K. Leick-Rude, K. A. Meinert, E 'Overcoming Barriers to Oxygen Saturation T		-	n, and ar (ABES) ABES) mining, (ABES)	No adherence studied
21 22 23 24 25	J. Fortney, M. Enderle, S. McDougall, J. Clot Quality Improvement for Depression in Va Co			of Everenjo Penenjopen.br	Timeframe < 1 year
26 27 28 29	J. B. Froehlich, D. Karavite, P. L. Russman, N College of, and Association American Heart, Guidelines Reduce Resource Utilization befo	'American College of Cardiology/Ar	nerican Heart Association Preop		No adherence studied
30 31 32 33 34	L. Y. Fu, M. Weissman, R. McLaren, C. Thon Immunization Delivery to an at-Risk Population				Timeframe < 1 year
35 36 37 38 39 40 41 42 43	C. Fuller, S. Michie, J. Savage, J. McAteer, S Roberts, L. Teare, and S. Stone, 'The Feedba A Stepped Wedge Cluster Randomised Cont	ack Intervention Trial (Fit) - Improvir			
43 44 45 46 47	F	or peer review only - http://bmjop	en.bmj.com/site/about/guideli	nes.xhtmb	

BMJ Open BMJ Open	
P. W. Lee, A. J. Dietrich, T. E. Oxman, J. W. Williams, Jr., and S. L. Barry, 'Sustainable Impact of a Primary Care Depression Intervention', J Am Board Fam Med, 20 (2007), 427-33.	No focus on a clinical practice guideline
V. Ganju, 'Mental Health Quality and Accountability: The Role of Evidence-Based Practices and Performance Measurement', Administration & Policy in Mental Health, 33 (2006), 659-65.	No research article
M. Gazarian, and L. V. Graudins, 'Long-Term Reduction in Adverse Drug Events: An Evidence-Based Improvement Model Pediatrics, 129 (2012), e1334-e42.	Timeframe < 1 year
K. M. Gendron, S. Y. Lai, G. S. Weinstein, A. A. Chalian, J. M. Husbands, P. F. Wolf, L. DiDonato, and R. S. Weber, 'Chief a Care Pathway for Head and Neck Cancer: A Valuable Tool for Decreasing Resource Utilization', Archives of Otolaryngology - Head and Chief a Care Pathway 128 (2002), 258-62.	No adherence studied
M. F. Gerdtz, R. Waite, T. Vassiliou, B. Garbutt, R. Prematunga, and E. Virtue, 'Evaluation of a Multifaceted Intervention of Vital Signs at Triage: A before-and-after Study', EMA - Emergency Medicine Australasia, 25 (2013), 180 37.	Timeframe < 1 year
V. Gibbons, T. Esselink, and S. McHugh, 'Assessing Practice Relating to Fall Risk Management among Nurses in an Active Ward Setting: A Best Practice Implementation Report', JBI Database of Systematic Reviews and Implementation Reports, 11 (2013) 27585.	Insufficient information provided
F. Gillissen, S. M. C. Ament, J. M. C. Maessen, C. D. Dirksen, T. Van Der Weijden, and M. F. Von Meyenfeldt, 'Sustain bility of an Enhanced Recovery Programme in Colonic Surgery in the Netherlands', European Journal of Cancer, 49 (2013), S53 S34.	Timeframe < 1 year
Edward M. Glaser, 'Durability of Innovations in Human Service Organizations: A Case-Study Analysis', Science Communication, 3 (1981), 167-85.	No focus on a clinical practice guideline
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtm	

Page 37	37 of 78 BMJ Open copyri 97 of 78 BMJ Open copyri	
1 2 3 4 5	S. G. Anthony, L. M. Prevedello, M. M. Damiano, T. K. Gandhi, P. M. Doubilet, S. E. Seltzer, and R. Khorasani, 'Impact of aga-Year Improvement Initiative to Improve Communication of Critical Imaging Test Results', Radiology, 259 (2011), 802-07.	Quality Timeframe < 1 year
6 7 8 9 10	L. Gonzalez, J. F. Elgart, H. Calvo, and J. J. Gagliardino, 'Changes in Quality of Care and Costs Induced by Implementation of a D Program in a Social Security Entity of Argentina', ClinicoEconomics and Outcomes Research, 5 (2013), 337-45.	Diabetes No adherence studied
11 12 13 14 15	M. L. Grayson, P. L. Russo, M. Cruickshank, J. L. Bear, C. A. Gee, C. F. Hughes, P. D. R. Johnson, R. McCann, A. J. Maguelan, B. Mitchell, C. E. Selvey, R. E. Smith, and I. J. Wilkinson, 'Outcomes from the First 2 Years of the Australian National Hard Figure Initiative', Medical Journal of Australia, 195 (2011), 615-19.	G. Timeframe < 1 year
16 17 18 19 20	T. Greenhalgh, F. Macfarlane, C. Barton-Sweeney, and F. Woodard, "If We Build It, Will It Stay?" A Case Study of the Gueranian abilit Whole-System Change in London', Milbank Q, 90 (2012), 516-47.	y of No adherence studied
21 22 23 24 25	R. Grol, J. Braspenning, R. Dijkstra, M. Hulscher, and M. Wensing, 'Implementation of Nhg Guidelines: Success or Problem?. [Dur	ch] No research article
26 27 28 29	Terry J. Hannan, Stanley Bart, Colin Sharp, Mathew J. Fassett, and Robert G. Fassett, 'The Sustainability of Medical Morring Han Reporting: Adherence in a Regional Hospital', Australian Health Review, 34 (2010), 325-27.	dover No focus on a clinical practice guideline
30 31 32 33 34	M. F. Harris, C. Hobbs, G. P. Davies, S. Simpson, D. Bernard, and A. Stubbs, 'Implementation of a Snap Intervention in the Division General Practice: A Feasibility Study', Medical Journal of Australia, 183 (2005), S54-S58.	ons of Timeframe < 1 year
35 36 37 38 39 40 41 42 43	J. S. Haukoos, E. Hopkins, V. T. Eliopoulos, R. L. Byyny, K. A. Laperriere, M. X. Mendoza, M. W. Thrun, and H. I. V. Testing Study Denver Emergency Department Rapid, 'Development and Implementation of a Model to Improve Identification of Patients infected Hiv Using Diagnostic Rapid Testing in the Emergency Department', Academic Emergency Medicine, 14 (2007), 1149-57.	•
43 44 45 46 47	For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmb	

	BMJ Open	Jopen-zoro- 4 by copyrig		
	provement in Surgical Infection Prevention Measures for Hysal Association for Healthcare Quality, 29 (2007), 50-56.	<u> </u>		Timeframe < 1 year
	avies, Irmajean Bajnok, and Melissa Waggott, 'Using the Nhs ons of Canadian Nursing Guideline Early Adopters', Journal o			No adherence studied
	ns, G. R. Bond, K. Henderson, and A. T. Cooley, 'Prescriber ment of Schizophrenia', Psychiatric Services, 60 (2009), 929-	03-	2	Paper is not about sustainability
P. Hudson, and A. Kupa, 'Anaphylaxis Discharge Ma	anagement "Reducing the Risk"', Internal Medicine Journal, 4	40 (20ata mining, 10 (20ata mining,		Insufficient information provided
———, 'Optimising Anaphylaxis Discharge Manage	ment', Allergy: European Journal of Allergy and Clinical Imm	unology, 64 Ay, 64 Joper Jone Ay, 64 Joper Jone Joper Jone Joper Jone Jone Joper Jone Jone Joper Jone Jone Jone Jone Jone Jone Jone Jone		Insufficient information provided
A. Jamal, G. O'Grady, E. Harnett, D. Dalton, and D. Improvement Approach', BMJ Quality & Safety, 21 (Andresen, 'Improving Hand Hygiene in a Paediatric Hospital 2012), 171-76.	: A Mutimilar tec		Timeframe < 1 year
	Maintenance of Practice Guidelines to Decrease Central Lir ation', Biology of Blood and Marrow Transplantation, 1) (2013		.	Insufficient information provided
a Care Pathway for the Last Days of Life', Internatio	borative Care Pathway Project; 10 Years Experience of Impl nal Journal of Care Pathways, 15 (2011), 39-43. r review only - http://bmjopen.bmj.com/site/about/guideli	enc		No adherence studied
For peer	r review only - http://bmjopen.bmj.com/site/about/guideli	nes.xhtmb	-	

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45 46

Page 39	of 78	BMJ Open	d by copyrig		
1 2 3 4 5	L. C. Kahwati, T. X. Lance, K. R. Jones, and L. S. Kinsing Management Program', Translational Behavioral Medicin	er, 'Re-Aim Evaluation of the Veterans Health Administration, 1 (2011), 551-60.	_	ove! Weight	Paper is not about sustainability
6 7 8 9 10	T. G. Kampmeier, R. P. Lukas, C. Steffler, C. Sauerland, in Cpr Guidelines-Improved but Not Sufficient', Resuscita	Γ. P. Weber, H. Van Aken, and A. Bohn, 'Chest Compressio tion, 85 (2014), 503-08.	n Duses rela	after Change	Timeframe < 1 year
11 12 13 14 15	· · · · · · · · · · · · · · · · · · ·	dan, E. J. Thomas, and K. P. Lally, 'A Tale of 2 Hospitals: A rith Antibiotic Prophylaxis Guidelines', Surgery, 148 (2010),	0 -	-	Timeframe < 1 year
16 17 18 19 20		aborative to Reduce Methicillin-Resistant Staphylococcus / tient safety / Joint Commission Resources, 37 (2011), 154-		÷	No adherence studied
21 22 23 24	D. J. Kenny, and P. Goodman, 'Care of the Patient with E 59 (2010), S22-S31.	nteral Tube Feeding: An Evidence-Based Practice Protoco	training,	ng Research,	Timeframe < 1 year
25 26 27 28 29	J. King, and J. A. Gold, 'Sustaining Improvements in Qua	lity', Wisconsin Medical Journal, 113 (2014), 37.	and similar te		No research article
30 31 32 33 34	and E. Alihonou, 'Sustainability of Primary Health Care In	un, K. Pangu, I. Hopwood, R. Grandcourt, K. L. Tinguiri, I. cluding Expanded Program of Immunizations in Bamako Ir in Benin and Guinea', International Journal of Health Planr	nitigetive	Programs in	No research article
35 36 37 38 39 40 41 42 43		tervention to Reduce Infections of Esbl- and Ampc-Produc		am-Negative	Timeframe < 1 year
44 45 46 47	For peer revi	ew only - http://bmjopen.bmj.com/site/about/guidelines			

by copyrig BMJ Open BMJ Open	
B. S. Kodali, D. Kim, R. Bleday, H. Flanagan, and R. D. Urman, 'Successful Strategies for the Reduction of Operating Book Turnover Times in a Tertiary Care Academic Medical Center', Journal of Surgical Research, 187 (2014), 403-11.	No focus on a clinical practice guideline
D. J. Kolko, A. M. Iselin, and K. J. Gully, 'Evaluation of the Sustainability and Clinical Outcome of Alternatives for Families: Cognitive- Behavioral Therapy (Af-Cbt) in a Child Protection Center', Child Abuse Negl, 35 (2011), 105-16.	One measurement
R. Kramer, R. Groom, D. Weldner, P. Gallant, B. Heyl, R. Knapp, and A. Arnold, 'Glycemic Control and Reduction of Der Sternal Wound Infection Rates: A Multidisciplinary Approach', Archives of Surgery, 143 (2008), 451-6.	No adherence studied
D. Kunyk, C.Els, S. Papadakis, P. Selby, "Tobacco use disorder treatment in primary care: implementing a clinical system from a clinical	Timeframe < 1 year
J. Lagan, P. Garg, J. M. Tang, and M. Burgess, 'Oxygen Therapy in Patients with Chest Pain of Acute Onset: Single Centre Audit Experience', British Journal of Hospital Medicine, 74 (2013), 347-9.	Timeframe unclear
B. Lai, C. Gibb, J. Pink, and L. Thomas, 'Sustainability of a Pharmacist-Driven Pathway for Osteoporosis-Related Fractures on an Orthopaedic Unit after a 5-Year Period', International Journal of Pharmacy Practice, 20 (2012), 134-37.	Timeframe < 1 year
B. C. C. Lam, J. Lee, and Y. L. Lau, 'Hand Hygiene Practices in a Neonatal Intensive Care Unit: A Multimodal Intervention and Impact on Nosocomial Infection', Pediatrics, 114 (2004), e565-71.	Timeframe < 1 year
S. M. Levy, C. E. Senter, R. B. Hawkins, J. Y. Zhao, K. Doody, L. S. Kao, K. P. Lally, and K. Tsao, 'Implementing a Surgical Checklist: More Than Checking a Box', Surgery, 152 (2012), 331-6.	Paper is not about sustainability
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtm	

 $\begin{array}{c} 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 24\\ 25\\ 26\\ 27\\ 28\\ 29\\ 30\\ 31\\ 32\\ 33\\ 34\\ 35\\ 36\\ 37\\ 38\\ 39 \end{array}$

Page 40 of 78

Page 41 of 78		BMJ Open	d by copy	liopen-20	
1 2 3 4 5		on, and L. Daniels, 'Improving the Performance of Nutri ion Journal on Quality & Patient Safety, 40 (2014), 178-		Bough a Series	Timeframe < 1 year
6 7 8 9 10	C. Lourenco, D. Kandula, L. Haidula, A. Ward, J.M of case management training interventions in Kava	l. Cohen, "Strengthening malaria diagnosis and approp ango Region." Malaria Journal 13 (2014) 508.	riate treatment in Enseigne relate	cember	Short term and long term data were presented combined
11 12 13 14 15	N. Lubisch, R. Roskos, and S. M. Sattler, 'Improvir Patient Safety, 34 (2008), 192-5.	ng Outcomes in Pediatric Procedural Sedation', Joint Co	ommission Journant of text an and the state of the state	_ ·	Insufficient information provided
16 17 18 19	S. Mace, and D. Taylor, 'Improving Adherence to N Psychiatrist, 35 (2011), 63-67.	lice Guidance for Bipolar Illness: Valproate Use in Wom	d eurin nen of Childbaarin minis minis	-h	Timeframe < 1 year
20 21 22 23 24 25		ebre, D. Jaswal, and P. Dodek, 'Introduction of a Comp provements in Timeliness of Care and Survival', Quality	· · · ·		Timeframe < 1 year
26 27 28 29	A. Maher, 'A Multi-Faceted Approach to Reducing Parenteral Nutrition', American Journal of Infection	Risk of Bloodstream Infections for Pediatric Rehabilitati Control, 37 (5) (2009), E37-E38.	ion Patients Rece	<u> </u>	Timeframe < 1 year
30 31 32 33 34	G. P. Martin, S. Weaver, G. Currie, R. Finn, and R. Clinically Led Change in Routine Practice', Health	McDonald, 'Innovation Sustainability in Challenging He Serv Manage Res, 25 (2012), 190-9.	ealth-Care Conte		No adherence studied
35 36 37 38 39 40 41 42 43		plementation of Biomedical Research Advances: Critica ry Improvement Initiative', BMJ Quality and Safety, 23 ((2014), i95-i103.		No research article
43 44 45 46 47	For pe	er review only - http://bmjopen.bmj.com/site/about/o	guidelines.xhtm		

d by copyrig BMJ Open	
Mohamad G. Fakih, Janice E. Rey, Margarita E. Pena, Susanna Szpunar, and Louis D. Saravolatz, 'Sustained Reductions on Urinary Catheter Use over 5 Years: Bedside Nurses View Themselves Responsible for Evaluation of Catheter Necessity', American Journal of Infection Control, 41 (2013), 236-39.	No adherence studied
J. Mayer, B. Mooney, A. Gundlapalli, S. Harbarth, G. J. Stoddard, M. A. Rubin, L. Eutropius, B. Brinton, and M. H. Samore Dissemination and Sustainability of a Hospital-Wide Hand Hygiene Program Emphasizing Positive Reinforcement', Infection Control	Timeframe < 1 year
W. M. McClellan, D. L. Frankenfield, P. R. Frederick, W. D. Flanders, A. Alfaro- Correa, M. Rocco, and S. D. Helgersor in Dialysis Therapy Be Improved? A Report from the Esrd Core Indicators Project', American Journal of Kidney Diseases, 34 (1990), 5075-82.	Timeframe < 1 year
R. McDermott, F. Tulip, B. Schmidt, and A. Sinha, 'Sustaining Better Diabetes Care in Remote Indigenous Australian (Comparison of the comparison of the comp	No adherence studied
C. McDonnell, 'Interventions Guided by Analysis of Quality Indicators Decrease the Frequency of Laryngospasm During Padiatric Anesthesia', Paediatric Anaesthesia, 23 (2013), 579-87.	Timeframe < 1 year
M. McDonnell, C. Reynolds, E. Nic Dhonncha, A. O'Connell, M. O'Donnell, and T. Walsh, 'Audit of Acute Stroke Care: Emergency Department to the Acute Stroke Unit', Irish Journal of Medical Science, 181 (2012), S277.	Insufficient information provided
G. J. McHugo, R. E. Drake, R. Whitley, G. R. Bond, K. Campbell, C. A. Rapp, H. H. Goldman, W. J. Lutz, and M. T. Firger , 'Fidelity Outcomes in the National Implementing Evidence-Based Practices Project', Psychiatric Services, 58 (2007), 1279-84.	Paper is not about sustainability
Christine McMullan, Grace Propper, Christine Schuhmacher, Lisa Sokoloff, David Harris, Paul Murphy, and William H. Gradene, 'A Multidisciplinary Approach to Reduce Central Line-Associated Bloodstream Infections', Joint Commission Journal on Quality & Patient Safety, 39 (2013), 61-69.	Timeframe < 1 year
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmb	

Page 43	3 of 78 BMJ Open		jopen-2015 by copyrig	
1 2 3 4 5	K. Meier, 'Sustainability in Health Care - Changing Mind, Knowledge and Behaviour', European Jo 3.		iah 5-0	No research article
6 7 8 9 10	M. J. Mello, J. Bromberg, J. Baird, T. Nirenberg, T. Chun, C. Lee, and J. G. Linakis, 'Translation of Intervention Guidelines to Pediatric Trauma Centers', Journal of Trauma and Acute Care Surgery,	Alcohol Screening a 75 (2013), S301-S0	9 Dacember 20 d Enseigne	Timeframe < 1 year
11 12 13 14 15	J. Melnikow, N. D. Kohatsu, and B. K. S. Chan, 'Put Prevention into Practice: A Controlled Evaluat 90 (2000), 1622-25.	on', American Jourr	Public Health, Download text and	Timeframe < 1 year
16 17 18 19 20	W. C. Mertens, D. J. Higby, D. Brown, R. Parisi, J. Fitzgerald, E. M. Benjamin, and P. K. Lindenaue Regard to Chemotherapy-Induced Nausea and Emesis: The Effect of Feedback to Clinicians on A Guidelines', Journal of Clinical Oncology, 21 (2003), 1373-78.			Timeframe < 1 year
21 22 23 24 25	A. Mian, C. Russell, M. Honeycutt, and C. Oldridge, 'Multidisciplinary Approach to Reduction of Ce Infections (Clabsi): An Institutional Experience with Collaborative Guidelines', The Journal of the A 128-31.			Insufficient information provided
26 27 28 29 30	M. R. Miller, M. Griswold, J. M. Harris, II, G. Yenokyan, W. C. Huskins, M. Moss, T. B. Rice, D. Rid Muething, and R. J. Brilli, 'Decreasing Picu Catheter-Associated Bloodstream Infections: Nachri's National Association of Children's Hospitals and Related Institutions', Pediatrics, 125 (2010), 206-	Quality Transformati	() <mark>0</mark> ·	Timeframe < 1 year
31 32 33 34	M. R. Miller, M. F. Niedner, W. C. Huskins, E. Colantuoni, G. Yenokyan, M. Moss, T. B. Rice, D. Ric 'Reducing Picu Central Line - Associated Bloodstream Infections: 3-Year Results', Pediatrics, 128			Timeframe < 1 year
35 36 37 38 39 40 41 42 43	L. S. Segre, M. W. O'Hara, R. L. Brock, and D. Taylor, 'Depression Screening of Perinatal Women Project: Program Description and Evaluation', Psychiatric Services, 63 (2012), 250-5.	by the Des Moines I	Headiny Start Bibliographique	The paper is focused on public health
44 45 46 47	For peer review only - http://bmjopen.bmj.com/site/	about/guidelines.xl	ntmbe	

BMJ Open	ijopen-2015- 1 by copyrig		
D. M. Nestler, A. Noheria, L. H. Haro, L. G. Stead, W. W. Decker, L. N. Scanlan-Hanson, R. J. Lennon, Rihal, M. R. Bell, and H. H. Ting, 'Sustaining Improvement in Door-to-Balloon Time over 4 Years: The M Infarction Protocol', Circulation: Cardiovascular Quality and Outcomes, 2 (2009), 508-13.	C. C. Lim, D. R. Hog		No adherence studied
G. T. O'Connor, S. K. Plume, E. M. Olmstead, J. R. Morton, C. T. Maloney, W. C. Nugent, F. Hernandez, Coffin, C. A. Marrin, D. Wennberg, J. D. Birkmeyer, D. C. Charlesworth, D. J. Malenka, H. B. Quinton, a Intervention to Improve the Hospital Mortality Associated with Coronary Artery Bypass Graft Surgery. Th Cardiovascular Disease Study Group', JAMA, 275 (1996), 841-6.	nd J. F. Kaspe	egional	No focus on a clinical practice guideline
B. Ostrowsky, S. Sharma, M. Defino, Y. Guo, P. Shah, S. McAllen, P. Chung, S. Brown, J. Paternoster, A Bhalla, 'Antimicrobial Stewardship and Automated Pharmacy Technology Improve Antibiotic Appropriate Pneumonia', Infection Control and Hospital Epidemiology, 34 (2013), 566-72.			Timeframe < 1 year
E. Pawlowski, and D. Hobbs, 'A Large Community Hospital's Multi-Disciplinary Approach to Code Stroke	e', Stroke, 44 (a) a day (ABES) · · · · · · · · · · · · · · · · · · ·		Insufficient information provided
R. Paul, S.P. McCutcheon, J.P. Tregarthen, L.T. Denend, S.A. Zenios, "Sustaining pressure ulcer best p care environment." American Journal of Nursing 114(8) (2014) 34-44; 45-36.	ractices in a high-vonjopen.br		Timeframe < 1 year
P. H. Perlstein, U. R. Kotagal, P. J. Schoettker, H. D. Atherton, M. K. Farrell, W. E. Gerhardt, and M. P. A Implementation of an Evidence-Based Guideline for Bronchiolitis', in Archives of Pediatrics & Adolescen	t Medicine (2000),⊉		Timeframe < 1 year
D. Petroudi, 'Nosocomial Infections and Staff Hygiene', Journal of Infection in Developing Countries, 3 (2009), 152-56iogies.		No research article
L.R. Putnam, S.M. Levy, M. Sajid, D.A. Dubuisson, N.B. Rogers, L.S. Kao, K.P. Lally, K. Tsao, "Multiface adherence to the surgical checklist." Surgery 156(2) (2014): 336-344.	t Agence Bibliographique	-	Timeframe < 1 year
For peer review only - http://bmjopen.bmj.com/site/about	t/guidelines.xhtmbe		

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	A. J. Porter, J. Y. Narimasu, M. F. Mulroy, and R. P. Koehler, 'S An "Attestation" Format for All Operating Team Members', Join Resources, 40 (2014), 3-9.		· _	0	Timeframe < 1 year
	P. J. Pronovost, C. A. Goeschel, E. Colantuoni, S. Watson, L. Cosgrove, J. B. Sexton, J. A. Marsteller, R. C. Hyzy, R. Welsh Catheter Related Bloodstream Infections in Michigan Intensive	, P. Posa, K. Schumacher, and D. Needham, 'Sus	taining	Juctions in	No adherence studied
	S. Provost, R. Pineault, P. Tousignant, M. Hamel, and R. B. Da Network for Prevention and Management of Cardiometabolic		·	many Care	No research article
	B. R. Rachman, and R. B. Mink, 'A Prospective Observational Reduce Unplanned Extubations in a Pediatric Intensive Care		cts of arraining, a	gram to	No adherence studied
	H. Ragazzi, A. Keller, R. Ehrensberger, and A. M. Irani, 'Evalu Pediatric Asthma', Journal of urban health : bulletin of the New		0, -	ש wement of ס ס	Timeframe < 1 year
	C. A. Rapp, R. J. Goscha, and L. S. Carlson, 'Evidence-Based (2010), 461-65.	Practice Implementation in Kansas', Community	mentaologies.	ath journal, 46 3, 2025 a	No adherence studied
	A. Rawn, and K. Wilson, 'Standardized Network Order Sets in Healthcare quarterly (Toronto, Ont.), 14 (2011), 95-100.	Rural Ontario: A Follow-up Report on Successes		t Agence Bibliographique	No research article
43 44 45 46 47	For peer review o	nly - http://bmjopen.bmj.com/site/about/guide	ines.xhtm	упе де I	

d by copyrig BMJ Open	
G. Regev-Yochay, M. Raz, R. Dagan, H. Roizin, B. Morag, S. Hetman, S. Ringel, N. Ben-Israel, M. Varon, E. Somekh, and E. Rubinstein, 'Reduction in Antibiotic Use Following a Cluster Randomized Controlled Multifaceted Intervention: The Israeli Judicious Antibiotic Prescription Study', Clinical Infectious Diseases, 53 (2011), 33-41.	Timeframe < 1 year
S. Reid, and J. McFarlin, 'Environmental Hygiene Sustainability-Is It Possible?', American Journal of Infection Control, 40 (2012), e68- e69.	Insufficient information provided
M. J. Richards, M. B. Robertson, J. G. A. Dartnell, M. M. Duarte, N. R. Jones, D. A. Kerr, L. L. Lim, P. D. Ritchie, G. J. Starton, and S. E. Taylor, 'Impact of a Web-Based Antimicrobial Approval System on Broad-Spectrum Cephalosporin Use at a Teaching Host start,' Medical Journal of Australia, 178 (2003), 386-90.	No focus on a clinical practice guideline
S. A. Roberts, C. Sieczkowski, T. Campbell, G. Balla, A. Keenan, Steering Auckland District Health Board Hand Hygie Working, 'Implementing and Sustaining a Hand Hygiene Culture Change Programme at Auckland District Health Board, Medical Journal, 125 (2012), 75-85.	Timeframe < 1 year
M. T. Roe, 'Success Stories: How Hospitals Are Improving Care', American Heart Journal, 148 (2004), S52-S55.	Timeframe unclear
J. M. Rothschild, S. McGurk, M. Honour, A. A. McClendon, P. Srivastava, W. H. Churchill, R. M. Kaufman, J. Avorn, E. Bates, 'Assessment of Education and Computerized Decision Support Interventions for Improving Transfusion Practice, Teansfusion, 47 (2007), 228-39.	Timeframe < 1 year
D. Bird, A. Zambuto, C. O'Donnell, J. Silva, C. Korn, R. Burke, P. Burke, and S. Agarwal, 'Adherence to Ventilator-Associated Pneumonia Bundle and Incidence of Ventilator-Associated Pneumonia in the Surgical Intensive Care Unit', Archives of Surgery, 146 (2010), 465-70.	Timeframe < 1 year
F. H. Rubin, K. Neal, K. Fenlon, S. Hassan, and S. K. Inouye, 'Sustainability and Scalability of the Hospital Elder Life Program at a Community Hospital', J Am Geriatr Soc, 59 (2011), 359-65.	No adherence studied
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtm	

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Page 47	of 78	BMJ Open	d by copyrig		
$\begin{array}{c}1\\2\\3\\4\\5\\6\\7\\8\\9\\10\\11\\12\\13\\14\\15\\16\\17\\18\\19\\20\\21\\22\\33\\24\\25\\26\\27\\28\\29\\30\\31\\32\\33\\34\\5\end{array}$		pliance with a Protocol for Intrapartum Antibiotic Prophylaxi Factors', Infectious Diseases in Obstetrics & Gynecology, 1	s againist k	· · ·	Short term and long term data were presented combined
	· · · · · ·	and H. H. Gutierrez, 'Sustained Improvement in Nutritional ovement Collaboratives', BMJ Quality and Safety, 23 (2014)		at Two	Timeframe < 1 year
	S. Scheithauer, F. Eitner, H. Hafner, J. Floege, and S Hemodialysis Setting', Infection, 41 (2013), 675-80.	5. W. Lemmen, 'Long-Term Sustainability of Hand Hygiene I	nprover text and	ts in the	Timeframe < 1 year
		an, M. R. Frankel, E. E. Smith, G. Ellrodt, C. P. Cannon, L. iated with Sustained Improvement in Care for Patients Hos , 107-15.	·		
	· · · · · · · · · · · · · · · · · · ·	nesma, D. Vandijck, W. Marneffe, H. Backes, S. Groothuis. ' herapy treatment processes are standardized?" European .			No focus on a clinical practice guideline
		Lolom, B. Regnier, M. Wolff, and J. C. Lucet, 'A Multifaceted ance with Preventive Measures', Critical Care Medicine, 38	~ (n) <mark>C</mark>		Timeframe < 1 year
		aufer, and E. R. Woods, 'Three Years of a Clinical Practice escents', Journal of Adolescent Health, 27 (2000), 57-62.	Guidebologies.	ა	No adherence studied
35 36 37 38 39 40 41 42 43	K.A. Smith, T.W. Matthews, M. Dube, G. Spence, J.C pathway." JAMA Otolaryngology Head & Neck Surg	C. Dort, "Changing practice and improving care using a low- gery 140(7) (2014): 630-634.	risk trache		Short term and long term data were presented combined
44 45 46 47	For peer	review only - http://bmjopen.bmj.com/site/about/guideli	nes.xhtmb	-	

BMJ Open	
K. C. Stange, M. A. Goodwin, S. J. Zyzanski, and A. J. Dietrich, 'Sustainability of a Practice-Individualized Preventive Service Delivery Intervention', Am J Prev Med, 25 (2003), 296-300.	Timeframe < 1 year
P. Sunaert, H. Bastiaens, F. Nobels, L. Feyen, G. Verbeke, E. Vermeire, J. De Maeseneer, S. Willems, and A. De Sutter, 'Brectiveness of the Introduction of a Chronic Care Model-Based Program for Type 2 Diabetes in Belgium', BMC Health Serv Res, 10 (2019), 207.	Timeframe unclear
K. Swain, R. Whitley, G. J. McHugo, and R. E. Drake, 'The Sustainability of Evidence-Based Practices in Routine Mental Health Agencies', Community Ment Health J, 46 (2010), 119-29.	Short term and long term data were presented combined
M. A. Swales, B. Taylor, and R. A. B. Hibbs, 'Implementing Dialectical Behaviour Therapy: Programme Survival in Routine Lealthcare Settings', Journal of Mental Health, 21 (2012), 548-55.	No adherence studied
T. R. Talbot, J. G. Johnson, C. Fergus, J. H. Domenico, W. Schaffner, T. L. Daniels, G. Wilson, J. Slayton, N. Feistritzer and G. B. Hickson, 'Sustained Improvement in Hand Hygiene Adherence: Utilizing Shared Accountability and Financial Incentive,', Infection Control and Hospital Epidemiology, 34 (2013), 1129-36.	Timeframe < 1 year
D. R. Taylor, 'Sustained Success of Collaboratively Developed Ondansetron Guidelines', Australian Journal of Hospita Pharmacy, 25 (1995), 522-25.	Insufficient information provided
J. Tjia, C. Lemay, K. M. Mazor, B. A. Briesacher, T. S. Field, A. O. Kanaan, J. L. Donovan, L. R. Harrold, and J. H. Gurgeitz, Dissemination of Evidence-Based Antipsychotic Prescribing Guidelines to Nursing Homes: A Cluster Randomized Trial', Journal of the Artierican Geriatrics Society, 62 (2014), S128.	Timeframe < 1 year
A. Mukerji, J. Narciso, C. Moore, A. McGeer, E. Kelly, and V. Shah, 'An Observational Study of the Hand Hygiene Initiative A Comparison of Preintervention and Postintervention Outcomes', BMJ Open, 3 (2013).	Timeframe < 1 year
For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmb	

Page 49	of 78	BMJ Open	by copyri	10000-20	
1 2 3 4 5	R. Van Acker, I. De Bourdeaudhuij, K. De Cocker, L. M. Klesges, A. Project '10,000 Steps': A Longitudinal Study', BMC Public Health, 12	· · · · · · · · · · · · · · · · · · ·	gh	2 mmunity	No adherence studied
6 7 8 9 10	D. Pittet, S. Hugonnet, S. Harbarth, P. Mourouga, V. Sauvan, S. Tour Programme to Improve Compliance with Hand Hygiene. Infection Co 30;356(9248):2196]', Lancet, 356 (2000), 1307-12.	-	· (7	Timeframe < 1 year
11 12 13 14 15	B. W. Warner, K. A. Rich, H. Atherton, C. L. Andersen, and U. R. Kot for Acute Appendicitis', Seminars in Pediatric Surgery, 11 (2002), 29-	•	ement Superi teduto text an	R Minical Pathway	No adherence studied
16 17 18 19 20	F. H. van Tiel, T. W. O. Elenbaas, B. M. A. M. Voskuilen, J. Herczeg, Act Cycles as an Instrument for Improvement of Compliance with Inf Surgery', Journal of Hospital Infection, 62 (2006), 64-70.			÷ ·	Timeframe < 1 year
21 22 23 24 25	B. W. Trautner, N. J. Petersen, A. Gendrett, S. Hysong, J. E. Patters Inappropriate Screening and Treatment in Patients with Urinary Cath			<	Timeframe < 1 year
26 27 28 29	A. L. Wentworth, C. H. Fox, L. S. Kahn, K. Glaser, and R. Cadzow, ^r Kidney Disease Care in a Primary Care Office', American Journal of		and similar te		No adherence studied
30 31 32 33 34	M. Whitby, M. L. McLaws, K. Slater, E. Tong, and B. Johnson, 'Three Compliance with Hand Hygiene: Is Sustained Replication Possible?'		•		Timeframe < 1 year
35 36 37 38 39 40 41 42 42	S. Whitelaw, N. Graham, D. Black, J. Coburn, and L. Renwick, 'Dever Healthy 'Settings': Insights from Nhs Health Scotland's Health Prome (2012), 127-37.		iterna		No research article
43 44 45 46 47	For peer review only - h	http://bmjopen.bmj.com/site/about/guidelines.			

BMJ Open of Ventilator-Associated Pneumonia: Results of a Longterm Performance-Improvement Project', Journal of the American College of unclear of Ventilator-Associate 2.1 Surgeons, 208 (2009), 700-4; discussion 04-5. R. B. Womer, E. Tracy, W. Soo-Hoo, B. Bickert, S. DiTaranto, and J. H. Barnsteiner, 'Multidisciplinary Systems Approach to Chemotherapy No adherence Safetv: Rebuilding Processes and Holding the Gains', Journal of Clinical Oncology, 20 (2002), 4705-12. D. M. Zerr, A. L. Allpress, J. Heath, R. Bornemann, and E. Bennett, 'Decreasing Hospital-Associated Rotavirus Infection and Multidisciplinary Hand Hygiene Campaign in a Children's Hospital' Redistric Infection and Statements and St Timeframe < 1 year N. Zwar, J. Henderson, H. Britt, K. McGeechan, and G. Yeo, 'Influencing Antibiotic Prescribing by Prescriber Feedback Management Guidelines: A 5-Year Follow-Up', in Family practice (2002), pp. 12-7. clinical practice http://bmjopen.bmj.com/ on June 13, 2025 at Agence Bibliographique ig, Al training, and similar technologies For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtmb

Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adherence LATE POST measurement	Time frame (years)
Ament [20]	Proportion of patients treated following guideline recommendations:	eet t			5
	1a.Treatment is discussed in a preoperative multidisciplinary meeting*(n)	86% (n=139/161)	95% (154/163)	100% (n=156/156)	
	1b.The interval between referral and first visit to the breast unit is 5 working days or less*(n)		61% (45/75)	84% (n=109/130)	
	1c.The interval between diagnostic tests and informing patients about the results is 5 working days or less*(n)		64% (n=105/163)	90% (n=133/147)	
	1d.The interval between the decision to operate and surgery is 15 working days or less*(n)		80% (n=131/163)	80% (n=128/160)	

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adherence LATE POST measurement	Time frame (years)
	1e.The general practitioner is informed about the diagnosis, treatment plan and potential side-effects prior to surgery*(n)		76% (n=123/163)	98% (n=156/160)	
	1f.The breast nurse stays in contact with the patient after short stay (phone consultation)* (n)		12% (n=19/163)	15% (n=24/159)	
	Overall	59%	65%	78%	
	(excluding missing values)	0			
	(original guideline comprises thirteen key recommendations)				
Benenson [21]	(1)Mean time to treatment	(1)314.7 min (SD=199.0)	(1)174.7 min (SD=113.1)	(1)171.2 min (SD=98.8)	3
		(0) 00 (50 10)			
	(2) Initial treatment given at emergency department	(2)36/63 (58.1%)	(2)90/96 (93.8%)	(2)118/122 (96.7%)	
Cates [22]	Annual number of prescriptions per 100 children < 5 years old (n)	Centre 1: n=139	Centre 1: n=95	Centre 1: n=76	Centre 1

	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	POST measurement	Time frame (years)
		Centre 2: n=122	Centre 2: n=67	Centre 2: n=61	Centre 2:
Enriquez- Puga [23]	(1)Number of items antibiotics (co-amixiclav and quinolone) prescribed for each six-month study period per 1000 patients	(1)Intervention group:	(1)Intervention group:	(1)Intervention group:	1.5
		6.9	4.6	5.8	
		(1)Control group:	(1)Control group:	(1)Control group:	
		5.8	6.2	6.4	
	(2)Number of items antidepressants (lofepramine and fluoxetine) prescribed for	(2)Intervention group:	(2)Intervention group:	(2)Intervention group:	
	each six-month study period per 1000 patients	26.7	27.7	28.6	
		(2)Control group:	(2)Control group:	(2)Control group:	
		20.9	21.4	20.8	

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adherence LATE POST measurement	Time frame (years)
	Notes: regression				
	analysis adjusting for baseline				
örsner [24]	1 Proportion of patients treated following guideline recommendations for depression				1.5
	1a Accessibility/wait time	Intervention group:	Intervention group:	Intervention group:	
		77.9% (n=95/122)	89.2% (n=107/120)	90% (n=216/240)	
		Control group:	Control group:	Control group:	
		59.0% (n=36/61)	53.3% (n=32/60)	51.7% (n=62/120)	
	1b Diagnostic assessment	Intervention group:	Intervention group:	Intervention group:	
		83.6% (n=102/122)	97.5% (n=117/120)	97.9% (n=235/240)	
		Control group:	Control group:	Control group:	
		88.5% (n=54/61)	90.0% (n=54/60)	79.2% (n=95/120)	
	1c Diagnostic instrument	Intervention group:	Intervention group:	Intervention group:	
		12.3% (n=15/122)	28.3% (n=34/120)	44.2% (n=106/240)	

Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
		Control group:	Control group:	Control group:	
		1.6% (n=1/62)	0% (n=0/60)	0.8% (n=1/120)	
	1d Standardized rating scale	Intervention group:	Intervention group:	Intervention group:	
	0	64.8% (n=79/122)	91.7% (n=110/120)	94.2% (n=226/240)	
		Control group:	Control group:	Control group:	
		44.3% (n=27/61)	33.3% (n=20/60)	36.7% (n=44/120)	
	1e Standardized rating scale during treatment	Intervention group:	Intervention group:	Intervention group:	
		50.0% (n=61/122)	87.5% (n=105/120)	88.3% (n=212/240)	
		Control group:	Control group:	Control group:	
		24.6% (n=15/61)	38.3% (n=23/60)	33.3% (n=40/120)	
	1f Substance/drug abuse	Intervention group:	Intervention group:	Intervention group:	
		46.7% (n=57/122)	87.5% (n=105/120)	88.8% (n=213/240)	
		Control group:	Control group:	Control group:	
		32.8% (n=20/61)	53.2% (n=32/60)	43.3% (n=52/120)	
	1g Treatment (care) plan	Intervention group:	Intervention group:	Intervention group:	

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Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
		59.8% (n=73/122)	87.5% (n=105/120)	91.3% (n=219/240)	
		Control group:	Control group:	Control group:	
		42.6% (n=26/61)	38.3% (n=23/60)	27.5% (n=33/120)	
	1h Evaluation/outcome	Intervention group:	Intervention group:	Intervention group:	
		66.4% (n=81/122)	95.8% (115/120)	95.8% (n=230/240)	
		Control group:	Control group:	Control group:	
		59.0% (n=36/61)	55.0% (n=33/60)	48.3 (n=58/120)	
	1i Continuity	Intervention group:	Intervention group:	Intervention group:	
		77.0% (n=94/122)	95.0% (n=114/120)	95.8% (n=230/240)	
		Control group:	Control group:	Control group:	
		78.7% (n=48/61)	61.7% (n=37/60)	68.3% (n=82/120)	
	1j Suicide assessment	Intervention group:	Intervention group:	Intervention group:	
		40.2% (n=49/122)	95.8% (n=115/120)	97.5% (n=234/240)	
		Control group:	Control group:	Control group:	
		45.9% (n=28/61)	35.0% (n=21/60)	30.0% (n=36/120)	

Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years
	1k Antidepressant medication	Intervention group:	Intervention group:	Intervention group:	
		54.1% (n=66/122)	90.8% (n=109/120)	92.5% (n=222/240)	
		Control group:	Control group:	Control group:	
	0	45.9% (n=28/61)	36.7% (n=22/60)	41.7% (n=50/120)	
	2 Proportion of patients treated following guideline recommendations for suicidal behaviour in % (n)	R C			
	2a Accessibility/wait time	Intervention group:	Intervention group:	Intervention group:	
		15.7% (n=19/121)	14.2% (n=17/120)	59.2% (n=142/240)	
		Control group:	Control group:	Control group:	
		29.5% (n=18/61)	31.7% (n=19/60)	0% (n=0/120)	
	2b Diagnostic assessment	Intervention group:	Intervention group:	Intervention group:	
		49.6% (n=60/121)	73.3% (n=88/120)	91.7% (n=220/240)	
		Control group:	Control group:	Control group:	

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Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
		26.2% (n=16/61)	16.7% (n=10/60)	0% (n=0)	
	2c Diagnostic instrument	Intervention group:	Intervention group:	Intervention group:	
		0% (n=0/121)	7.5% (n=9/120)	7.5% (n=18)	
	0	Control group:	Control group:	Control group:	
		0% (n=0/61)	0% (n=0/60)	0% (n=0)	
	2d Standardized rating scale	Intervention group:	Intervention group:	Intervention group:	
		41.3% (n=50/121)	67.5% (n=81/120)	78.3% (n=188)	
		Control group:	Control group:	Control group:	
		27.9% (n=17/61)	16.7% (n=10/60)	0.8% (n=1)	
	2e Standardized rating scale during treatment	Intervention group:	Intervention group:	Intervention group:	
		16.5% (n=20/121)	52.5% (n=63/120)	55.8% (n=134)	
		Control group:	Control group:	Control group:	
		16.4% (n=10/61)	10.0% (n=6/60)	5.0% (n=6)	
	2f Substance/drug abuse	Intervention group:	Intervention group:	Intervention group:	
		52.1% (n=63/121)	64.2% (n=77/120)	80.0% (n=192)	

Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years
		Control group:	Control group:	Control group:	
		55.7% (n=34/61)	56.7% (n=34/60)	29.2% (n=35)	
	2g Treatment (care) plan	Intervention group:	Intervention group:	Intervention group:	
	0	37.4% (n=68/182)	58.9% (n=106/120)	79.2% (n=190)	
		Control group:	Control group:	Control group:	
		44.3% (n=27/61)	41.7% (n=25/60)	0.8% (n=1)	
	2h Evaluation/outcome	Intervention group:	Intervention group:	Intervention group:	
		20.7% (n=25/121)	47.5% (n=57/120)	51.7% (n=124)	
		Control group:	Control group:	Control group:	
		19.7% (n=12/61)	8.3% (n=5/60)	0% (n=0)	
	2i Continuity	Intervention group:	Intervention group:	Intervention group:	
		86.0% (n=104/121)	81.7% (n=98/120)	91.3% (n=219)	
		Control group:	Control group:	Control group:	
		49.2% (n=30/61)	31.7% (n=19/60)	0% (n=0)	
	2j Suicide assessment	Intervention group:	Intervention group:	Intervention group:	

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Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
		55.4% (n=67/121)	93.3% (n=112/120)	97.1% (n=233)	
		Control group:	Control group:	Control group:	
		82.0% (n=50/61)	73.3% (n=44/60)	56.7% (n=68)	
	2k Specialist assessment	Intervention group:	Intervention group:	Intervention group:	
		50.4% (n=61/121)	85.4% (n=103/120)	91.7% (n=220)	
		Control group:	Control group:	Control group:	
		83.6% (n=51/61)	83.3% (n=50/60)	71.7% (n=86)	
	2l Follow-up	Intervention group:	Intervention group:	Intervention group:	
		72.7% (n=88/121)	88.3% (n=106/120)	92.1% (n=221)	
		Control group:	Control group:	Control group:	
		75.4% (n=46/61)	65.0% (n=39/60)	37.5% (n=45)	
	2m Evaluation assessment	Intervention group:	Intervention group:	Intervention group:	
		32.2% (n=39/121)	64.2% (n=77/120)	75.0% (n=180)	
		Control group:	Control group:	Control group:	
		18.0% (n=11/61)	13.3% (n=8/60)	10.8% (n=13)	

Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
Gerber [35]	Proportion of patients receiving care according to guideline recommendations	n= 396.074	n=253.516	n=unclear	1.5
	0	26,80%	14,30%	27,90%	
Higuchi [25]	1 Proportion of patients receiving care according to asthma guideline recommendations	Not clear	(total n=10)	(total n=62)	Asthma: Diabetes
	1a Respiratory assessment done	G	n=10/10 100%	n=61/62 98.4%	3
	Level of asthma control documented for :		2		
	1b medication in use		n=10/10 100%	n=61/62 98.4%	
	1c Use of B2 agonist		n=10/10 100%	n=52/62 84.4%	
	1d Experience of daytime symptoms		n=8/10 80.0%	n=32/62 51.7%	
	1e Experience of night time and/or awaking symptoms		n=8/10 80.0%	n=16/62 26.2%	
	1f Physical activity		n= unclear 77.8%	n=29/62 46.8%	

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Study ID	Primary outcome(s)	Adherence PRE measurement	Adherence EARLY POST measurement	Adherence LATE POST measurement	Time frame (years)
	1g Absence from school or work		n=7/10 70.0%	n=3/62 4.9%	
	1h Exacerbation		n=7/10 70.0%	n=47/62 76.2%	
	1i Individualised action plan developed for client's discharge		n=7/10 70.0%	n=2/62 3.2%	
	1j Baseline teaching information on asthma provided to patient by a nurse	5	n=6/10 60.0%	n=16/62 25.4%	
	1k Written information on asthma provided	CC.	n=6/10 60.0%	n=4/62 6.6%	
	2 Proportion of patients receiving care according to diabetes foot care		(total n=50)	(total n=65)	
	2a Assessment for risk factors: foot ulceration/amputation		n=22/50 44.0%	n=64/65 98.5%	
	2b Assessment loss of protective sensation		n=5/50 10.0%	n=10/65 15.6%	
	2c Assessment Structural or biochemical abnormalities		n=3/50 6.0%	n=59/65 90.8%	
	2d Assessment evidence of impaired circulation		n=1/50 2.0%	n=34/65 52.3%	
	2e Assessment Deficit in self-care behaviour		n=14/50 28.0%	n=10/65 15.4%	
	2f Monofilament used to assess sensation in the feet		n=21/50 42.0%	n=41/65 63.1%	

Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
	2g Risk classification for foot ulcer/amputation		n=37/50 73.7%	n=30/65 45.9%	
	Basic foot care education done on:				
	2h Client's risk factors		n=15/50 30.0%	n=53/62 81.5%	
	2i Daily self-inspection of feet		n=15/50 30.0%	n=53/62 81.5%	
	2j Proper nail and skin care	0	n=15/50 30.0%	n=54/62 83.1%	
	2k Injury prevention	1	n=15/50 30.0%	n=53/62 81.5%	
	2l When to seek help		n=15/50 30.0%	n=54/62 83.1%	
Kelly [26]	Proportion of patients receiving IM narcotic analgesia	76% (n=48/63)	NA	3% (n=2/65)	2
Knops [27]	(1)Proportion of patients receiving care according to fluid balance guideline recommendations	(1)NA	(1)NA	(1)100% (534/534)	7
	(2)Proportion of patients receiving care according to body temperature guideline recommendations	(2)NA	(2)91%	(2)50% (617/1226)	

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Study ID	Primary outcome(s)	Adherence PRE measurement		Adherence LATE POST measurement	Time frame (years)
Loszadi [28]	Proportion of patients receiving care according to guideline recommendations	61% (n=29/48)	79% (n=38/48)	92% (n=44/48)	unclear, >2
Mclaws [29]	(hand hygiene events observed / hand hygiene opportunities)x100 (%)	47% (3795/8057)	62% (NA)	58% (4041/6972)	1.5
Stephan [30]	Proportion of patients receiving care according to guideline recommendations	NA	82.2% (n=410/499)	80.8% (n=242/300)	1.5
Wakefield [31]	Proportion of patients receiving care according to guideline recommendations	Authors reported that the LATE POST compliance was lower compared to the EARLY POST measurement, but no further details were provided	NA	NA	1.5
Williams [32]	Proportion of patients treated according to guideline recommendations for the repair and follow-up of third degree tears		0		2
	A Senior SpR present	30% (n=13/44)	40% (n=20/50)	60% (n=18/30)	
	Theatre	70% (n=31/44)	82% (n=41/50)	97% (n=29/30)	

Study ID	Primary outcome(s)	Adherence PRE	Adherence EARLY		Time
		measurement	POST measuremen	POST measurement	frame (years
					Ŭ
	GA/Regional	70% (n=31/44)	82% (n=41/50)	97% (n=29/30)	
	Prolene	64% (n=28/44)	76% (n=38/50)	93% (n=28/30)	
	Overlap documented	30% (n=13/44)	E_{10}^{10} (n-07/E0)	67% (n=20/30)	
	Overlap documented	30 % (II=13/44)	54% (n=27/50)	07 /8 (II=20/30)	
			20		
na: not appli	cable				
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	Author:	Ament [20]] Benenson [21]	Cates [22]	Enriquez [23]	1733er Horsen 29 [17]	Gerber [35]	Higuchi [25]	Kelly [26]
 Reporting	comment					Dece for us			
Is the hypothesis/aim/objective of the study clearly described?		yes	yes	no	yes	jopen-2015-008073壺n 29 December 2015. D 资 石 Enseignement 1 by copyright, including for uses 強 ated to	yes	yes	yes
Are the main outcomes to be measured clearly described in the Introduction or Methods section?		yes	yes	yes	yes)ownloaded fr t Superieur (A text웤nd data	yes	yes	yes
Are the characteristics of the patients included in the study clearly described ?	Patients' was replaced by 'professionals'	yes	yes	yes	yes	om http://bmjo /BES) . mingng, Al tra	yes	yes	no
Are the interventions of interest clearly described?	Intervention was replaced by guideline	yes	yes	yes	yes	open.bmj.cor sining, and si	yes	yes	yes
Are the distributions of principal confounders in each group of subjects to be compared clearly described?		yes	yes	no	yes	Downloaded from http://bmjopen.bmj.com/ on June 13, 2025 nt Superieur (ABES) . o text and data minting, Al training, and similaຍ້technologie	yes	no	no
Are the main findings of the study clearly described?		yes	yes	yes	yes	2025 at Agence gieණ	yes	yes	no
Does the study provide estimates of the random variability in the data for the main outcomes?		na	na	na	na	ence Bibliographique na	na	na	na

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1 2			Author:	Ament [20]	Benenson	Cates [22]	-	Forser	Gerber [35]		Kelly [26]
3 4 5 6 7	8	Have all important adverse events that may be a consequence of the intervention been reported?		na	[21] na	na	[23] na	<u> </u>	na	[25] na	na
8 9 10 11 12	9	Have the characteristics of patients lost to follow-up been described?	Patients' was replaced by 'professionals'	utd	utd	utd	utd	ember 2015. D Engeignement seg related to	yes	utd	utd
13 14 15 16 17 18 19 20 21 22 23 24 25 26	10	Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?	Dee	yes	yes	utd	yes	December 2015. Downloaded from http://bmjopen.bmj.c Engeignement Superieur (ABES). for uses related to text and data mining, Al training, and	yes	no	yes
27 28 29 30 31 32		External validity						com/ on June 13, 2025 similar technologi⊛			
33 34 35 36 37 38 39 40 41 42 43	11	Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'. In case of general guideline and a multicentre study: yes. In case of a centre specific guideline and one guideline: yes. For peer review only -		no	utd	yes	i at Agenc	yes	no	no
44 45 46 47			For peer review only -	http://bmjoj	pen.bmj.con	n/site/abou	t/guidelines	.xhtmb			

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	Author:	Ament [20]		Cates [22]	Enriquez	igh Forseer	Gerber [35]		Kelly [26]
12 Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'	yes	[21] utd	utd	[23] no	jopen-2015-00 073 on 29 Decembe ဖို့ နာတို့ Ensei I by copyrighမ်းဖြာဖြင့်ဖျေမှိုding for uses r	yes	[25] no	utd
13 Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?		no	yes	yes	yes	r 2015. Downloaded from græment Superieur (ABE elæed to text and data mit	yes	yes	yes
Internal validity - bias						http: S) · hing,			
	Subjects' was replaced by 'professionals'	na	na	na	na	ttp://bmjopen.bmj.com/ ŋg, A旺raining, anGsimi	na	na	na
15 Was an attempt made to blind those measuring the main outcomes of the intervention?		utd	utd	utd	utd	ilar	no	utd	utd
16 If any of the results of the study were based on "data dredging", was this made clear?		no	no	no	no	June 13, 2025 at techn£ologies.	yes	no	no
17 In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case- control studies, is the time period between the intervention and outcome the same for cases and controls 2		na	na	na	yes	Agence Bibliographique	na	na	na
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1 2 3			Author:	Ament [20]	Benenson [21]	Cates [22]	Enriquez [23]	igh Fors 1941 17	Gerber [35]	Higuchi [25]	Kelly [26]
4 5 6 7	18	Were the statistical tests used to assess the main outcomes appropriate?		yes	yes	no	yes	jopen-2015-0000073 on 29 December سفح سفح by copyrigh الفرافط الإطing for use العامية rel	yes	yes	yes
8 9 10 11 12	19	Was compliance with the intervention/s reliable?		na	na	na	na	2015 neme ated	na	na	na
13 14 15 16 17 18 19	20	Were the main outcome measures used accurate (valid and reliable)?		yes	yes	yes	yes	. Downloaded from htt ent Superieur (ABES) to testt and data minin	yes	yes	yes
20 21		Internal validity - confounding (selection bias and power)			0.						
22 23 24 25 26 27 28	21	Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?	Patients' was replaced by 'professionals'	na	na	na	yes	p://bmjopen.bmj.com/ on June 13, 2025 g, Al traning, and similar the chnologies.	na	na	na
29 30 31 32 33 34 25	22	Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?	Study subjects' was replaced by 'professionals'	na	na	na	yes	n June 13, 2025 at ∞ rr∯echnologies.	na	na	na
35 36 37 38 39 40 41 42 43	23	Were study subjects randomised to intervention groups?	Subjects' was replaced by 'professionals'	no	no	no	yes	r Agence Bibliographique yes	no	no	no
44 45 46 47			For peer review only -	http://bmjop	pen.bmj.con	n/site/about	/guidelines	.xhtmb			

Kelly [26]

na

yes

utd

no

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	Author:	Ament [20]	Benenson [21]	Cates [22]	Enriquez [23]	Forseer	Gerber [35]	Higuchi [25]
24 Was the randomised intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?		na	na	na	utd	jopen-2015-0œ8073 on 29 December 또 Enseig t by copyrighCi嘧ugding for uses rel	na	na
25 Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?		no	yes	no	yes	2015. Download nement Superie 壡ed to text and	yes	no
26 Were losses of patients to follow-up taken into account?	Patients was replaced by professionals	utd	utd	utd	yes	led from http://bmjoj ur (ABES) . daga mining, Al trair	utd	utd
27 Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?		no	no	no	yes	http://bmjopen.bmj.com/ on June 13, 2025 5) . hing, Al traini智g, and similar technologies.	yes	yes
utd: Items were qualified as 'unable to de na: not applicable	etermine' when information was no		aan hmi con	n/cita/ahou	t/quidalines	ne 13, 2025 at Agence Bibliographique c hnologies.		
	i of peer review only -			., 510, 4504	- yuuu 11103.	ē		

Sup	oplementary File 4: Risk of bias	using the Downs and Blac	k				jopen-2015-00807386n 29 Decemb Ensv I by copyright, incleding for uses	
		Author:	Knops [27]	Lozsadi [28]	McLaws [29]	Stephan [30]	cieke Wake [3] [3] [3] [3] [3] [3] [3] [3] [3] [3]	William [32]
	Reporting	comment					Decer E	
1	Is the hypothesis/aim/objective of the study clearly described?		yes	yes	yes	yes	nber 2015. D nseignement s rélated to	yes
2	Are the main outcomes to be measured clearly described in the Introduction or Methods section?		yes	yes	yes	yes	ownloaded fr Superieur (Al text୍ ୁଲnd data	yes
3	Are the characteristics of the patients included in the study clearly described ?	Patients' was replaced by 'professionals'	yes	yes	yes	no	December 2015. Downloaded from http://bmjopen.bmj.com/ on June 13, 2025 Enseignement Superieur (ABES). or uses ଔated to texteand data mineng, Al training, and similaธtechnologieg	no
4	Are the interventions of interest clearly described?	Intervention was replaced by guideline	yes	yes	yes	yes	pen.bmj.com nir∰, and sim	yes
5	Are the distributions of principal confounders in each group of subjects to be compared clearly described?		no	yes	no	yes	/ on June 13, ; ila <u>5</u> technolog	yes
6	Are the main findings of the study clearly described?		yes	yes	yes	yes	2025 at Agen jie%	yes
7	Does the study provide estimates of the random variability in the data for the main outcomes?		na	na	na	na	ce Bibliographi	na
		For peer review only	- http://bmjop	en.bmj.co	m/site/abou	ut/guideline	s.xhtmbe	

		BMJ Open BMJ Open								
		Author:	Knops [27]	Lozsadi [28]	McLaws [29]	Stephan [30]	igh Make Wake	Williams [32]		
8	Have all important adverse events that may be a consequence of the intervention been reported?		na	na	na	na	73 on 29 Dec çl뇵ding for u	na		
9	Have the characteristics of patients lost to follow-up been described?	Patients' was replaced by 'professionals'	utd	utd	utd	utd	ember 2015. I Enseignemen seg related to	utd		
10	Have actual probability values been reported (e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?	Dee B	utd	utd	yes	yes	jopen-2015-0∰073 on 29 December 2015. Downloaded from http://bmjopen.bmj.com/ on June 13, 2025 Enseignement Superieur (ABES) . I by copyrigh in Heding for uses related to test and data mining, Al training, and similar technologies.	yes		
	External validity						som/ on June 13, similar technolog			
11	Were the subjects asked to participate in the study representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'. In case of general guideline and a multicentre study: yes. In case of a centre specific guideline and one guideline: yes. For peer review only - H	yes	no	yes	no	2025 at Agence Bibliographique lies.	yes		
		For peer review only - h	nttp://bmjop	en.bmj.con	n/site/about	/guidelines	.xhtmb			

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1 2 3			Author:	Knops [27]	Lozsadi [28]	McLaws [29]	Stephan [30]	igh Wäke∰eld [35]] ♀	Williams [32]
4 5 6 7 8 9	12	Were those subjects who were prepared to participate representative of the entire population from which they were recruited?	Subjects' was replaced by 'professionals'	yes	utd	yes	utd	jopen-2015-000073 on 29 December ; Enseign by copyrighgionuses relations for uses relations of the second second second second second second second second	yes
10 11 12 13 14 15 16 17 18	13	Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients receive?		yes	no	yes	no	er 2015. Downloaded from ignement Superieur (ABE: related to text and data mir	no
19 20		Internal validity - bias						<u>≓.⊜</u>	
20 21 22 23 24 25	14	Was an attempt made to blind study subjects to the intervention they have received?	Subjects' was replaced by 'professionals'	na	na	na	na		na
26 27 28 29 30	15	Was an attempt made to blind those measuring the main outcomes of the intervention?		utd	utd	utd	utd	//bmjopen.bmj.com/ on June 13, 202 Ateraining, andsimilar techteologies	utd
31 32 33 34 35	16	If any of the results of the study were based on "data dredging", was this made clear?		no	yes	yes	yes	ne 13, 2025 at hnoologies.	yes
36 37 38 39 40 41 42 43	17	In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case- control studies, is the time period between the intervention and outcome the same for cases and controls 2	Patients' was replaced by 'professionals'	na	na	na	na	Agence Bibliographique	na
44 45 46 47			For peer review only -	http://bmjop	ben.bmj.cor	n/site/abou	t/guidelines	s.xhtmb	

		BN	/IJ Open			ijopen-2013 d by copyri	
	Author:	Knops [27]		McLaws	Stephan	Wake	Williams
18 Were the statistical tests used to assess the main outcomes appropriate?		no	[28] utd	[29] yes	[30] yes	jopen-2015-0饆073 on 29 Decei E 4 by copyrigh颦i疎l倏ding for us	[32] yes
19 Was compliance with the intervention/s reliable?		na	na	na	na	ember 2015. Enseignemei se≋ related t	na
20 Were the main outcome measures used accurate (valid and reliable)?	Dee	yes	yes	yes	yes	Downloaded from htt nt Superieur (ABES) o teat and data minin	yes
Internal validity - confounding (selection bias and power)						p://bn g, Al t	
21 Were the patients in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited from the same population?	Patients' was replaced by 'professionals'	na	na	na	na	p://bmjopen.bmj.com/ on June , g, Al training, and similar techr	na
22 Were study subjects in different intervention groups (trials and cohort studies) or were the cases and controls (case-control studies) recruited over the same period of time?	Study subjects' was replaced by 'professionals'	na	na	na	na	əmj.com/ on June 13, 2025 a and similar ﷺ	na
23 Were study subjects randomised to intervention groups?	Subjects' was replaced by 'professionals' For peer review only - I	no	no	no	no	t Agence Bibliographiq no	no
	For peer review only - I	http://bmjop	en.bmj.con	n/site/about	/guidelines	.xhtmbe	

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45 46

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1 2 3 4	24 Was the randomised intervention	Author:	Knops [27] na	Lozsadi [28] na	McLaws [29] na	Stephan [30] na	5-0€eld Wake€8073 o	Williams [32] na
5 6 7 8 9	assignment concealed from both patients and health care staff until recruitment was complete and irrevocable?						jopen-2015-000073 on 29 December 2015. D. Enseignement by copyrigh المجاليطing for uses related to t	
10 11 12 13 14 15	25 Was there adequate adjustment fo confounding in the analyses from which the main findings were drawn?	Por Do	no	no	yes	yes	r 2015. Download gnement Superie lated to text and	no
16 17 18 19 20 21 22	26 Were losses of patients to follow-up taken into account?	Patients was replaced by professionals	utd	utd	utd	utd	led from http://bmjc ur (ABES) . da폋 mining, Al trai	utd
23 24 25 26 27 28 29 30	27 Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%?		no	no	no	yes	Downloaded from http://bmjopen.bmj.com/ on June 13, 2025 nt Superieur (ABES) . o text and dag mining, Al trainigg, and similar technologies.	no
31 32 33 34 35 36	utd: Items were qualified as 'unable to c na: not applicable						e 13, 2025 at Agu nologies.	
37 38 39 40 41 42		For peer review only -					ence Bibliographi	
43 44 45 46 47		For peer review only -	http://bmjop	oen.bmj.co	m/site/abou	t/guideline	que s.xhtmbe I	

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PRISMA Checklist		la l	
Section/topic	#	Checklist item	Reported or page #
TITLE		Ense esses	
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT		ated em	
Structured summary	2	Provide a structured summary including, as applicable: background; objective data sources; study eligibility criteria, participants, and interventions; study appraisal and synthe data sources; results; limitations; conclusions and implications of key findings; systematic review regestation number.	2
INTRODUCTION		d d d	
Rationale	3	Describe the rationale for the review in the context of what is already known $\frac{1}{2}$	4
Objectives	4	Provide an explicit statement of questions being addressed with reference termeticipants, interventions, comparisons, outcomes, and study design (PICOS).	4
METHODS		, , , , , , , , , , , , , , , , , , ,	
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	na
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report claracteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving ramonale.	4,5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any lingits used, such that it could be repeated.	5, additional file 1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in Systematic review, and, if applicable, included in the meta-analysis).	4,5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5,6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5,6

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	·	BMJ Open BMJ Open	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (inclue ing specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	na
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if consistency (e.g., I ²) for each meta-analysis.	na
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evider be determined by the selective reporting within studies).	na
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	na
RESULTS		nd e	Ī
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the topiew, with reasons for exclusions at each stage, ideally with a flow diagram.	7
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., size, PICOS, follow-up period) and provide the citations.	7, ta
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level as essment (see item 12).	16,
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a single summary data for each intervention group (b) effect estimates and confidence intervals, ideally, with a forest plot.	13, add 3
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and geasures of consistency.	na
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 1.).	16,
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	13
DISCUSSION		gie:	
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main officome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	16,1
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-	17,1
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7, table 1

16, table 4

13, table 3,

16, table 4

additional file

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Conclusions 26	BMJ Open Provide a general interpretation of the results in the context of other evidence research. Describe sources of funding for the systematic review and other support (e.g. funders for the systematic review.	-2015-00807a	d implications for future	19	1
	research.	, agon 2 Birdin		13	
FUNDING		- 19 - 10 - 10			
Funding 27	Describe sources of funding for the systematic review and other support (e.g funders for the systematic review.	semi SEns	oply of data); role of	19	
		13, 2029 Monies			