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Short report

Methods for producing a national infection prevention and control manual (NIPCM) in Scotland

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order to produce and maintain an evidence based resource that would appeal to national and international partner organisations, including academia. Following an options appraisal that considered resource and potential risks/benefits, the current NIPCM literature review methodology was revised and a two-person systematic methodology was introduced. The two-person methodology is more closely aligned to the methods of internationally recognised guideline producers and the NIPCM literature reviews will be produced to this methodology in the future. This article describes the processes involved in both the single and two-person NIPCM methodologies and discusses their strengths and weaknesses in comparison with other relevant guidance developer's methods.

Introduction

The NHSScotland National Infection Prevention and Control Manual (NIPCM) (http://www.nipcm.hps.scot.nhs.uk/) is an evidence-based practice guide for use by front-line staff. The NIPCM is mandatory for NHSScotland employees and applies to all healthcare settings. It can also be used in other care settings (for example care homes) where it should be considered best practice.

The NIPCM is a 'once for Scotland approach'. The aims are to:

- Support a common understanding: making the right thing easy to do for every patient, every time;
- Reduce variation in practice and standardise care processes;
- Help reduce the risk of healthcare associated infection (HAI);
- Help align practice with education, monitoring, quality improvement and scrutiny.

In 2018, six years after initial publication, it was decided to enhance the literature review methodology for the NIPCM in

History of the NIPCM

The NIPCM was first published on 13 January 2012 and mandated by the Chief Nursing Officer, [1] it consisted of a single chapter, Chapter 1: Standard Infection Control Precautions (SICPs) which was later updated on 17 May 2012. [2] To promote the use of the NIPCM a National SICPs campaign was launched across NHSScotland to promote the '10 elements of SICPs' described in the NIPCM. Chapter 1 was followed in 2014 by Chapter 2: Transmission Based Precautions (TBPs). In 2016, the most recent chapter of the NIPCM was published, Chapter 3: Healthcare Infection Incidents, Outbreaks and Data Exceedances (see Table 1).

A number of supporting resources are also available to complement the NIPCM including a compliance monitoring tool which may be utilised locally to monitor and record compliance with elements of the NIPCM. In 2018 the NIPCM was formally adopted by NHS Wales and published on NHS Wales website with an endorsement by the Chief Nursing Officer for Wales. [3] In 2019 a directive that 'England will adopt the Scottish Infection Prevention and Control Manual' was made as part of the UK antimicrobial resistance (AMR) strategy. [4].

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Table 1
Contents of the national infection prevention and control manual (NIPCM)

Chapter	Sections
Chapter 1: Standard Infection Control Precautions (SICPs) (2012) http://www.nipcm.hps.scot.nhs.uk/chapter-1-standard-infection-control-precautions-sicps/	• Patient placement; • Hand hygiene; • Respiratory and cough hygiene; • Personal protective equipment; • Safe management of care equipment; • Safe management of the care environment; • Safe management of linen; • Safe management of blood and body fluid spills; • Safe disposal of waste; and • Occupational safety: prevention and exposure management (including sharps).
Chapter 2: Transmission Based Precautions (TBPs) (2014) http://www.nipcm.hps.scot.nhs.uk/chapter-2-transmission-based-precautions-tbps/	• Patient placement (isolation and cohorting); • Safe management of patient care equipment in an isolation room/cohort area; • Safe management of the care environment; • Personal protective equipment; and • Infection prevention and control during care of the deceased.
Chapter 3: Healthcare Infection Incidents, Outbreaks and Data Exceedances (2016) http://www.nipcm.hps.scot.nhs.uk/chapter-3-healthcare-infection-incidents-outbreaks-and-data-exceedance/	• Definitions of Healthcare Infection Incident, Outbreak and Data Exceedance; and • Detection and recognition of a Healthcare Infection incident/outbreak or data exceedance.

Oversight — National Infection Prevention and Control (NIPC) steering and consensus groups

A wide group of stakeholders, including experts from all appropriate multidisciplinary groups, are involved in the development and maintenance of the NIPCM. This continuous consultation and collaboration with key stakeholders seeks to ensure that the NIPCM and its associated literature reviews and supporting resources are risk-based and proportionate, and in a format that is applicable and accessible to all care staff.

As stated, the NIPCM is presented in chapters; a consensus group is created for the development of each new chapter. The NIPC consensus group is responsible for:

- Agreeing the content of any supporting resources/tools to ensure they are implementable across all care setting.
- Providing expert opinion and support to the development and implementation of national infection prevention and control policy (practice guides) and associated resources that are acceptable for use across all care settings.
- Contributing to the consultation and testing process of national infection prevention and control policy and any new supporting documents and tools if required.
- Providing input at meetings; representing the views of all appropriate staff members/groups within and across the represented organisations/region.

Typically, following publication of a new chapter the consensus group is disbanded and the NIPC steering group oversees the maintenance of the manual chapters and all associated literature reviews and resources.

The roles and responsibilities of all NIPC steering group members include:

- Contributing to the consultation process on the NIPCM (including literature reviews and any supporting documents/tools); feeding back the views of the professional groups/organisations they represent such as barriers to implementation;
- Contributing to the identification of evidence/research gaps in the literature pertaining to the NIPCM and support the development of research studies to enhance the evidence base;
- Identifying/reviewing/updating new or existing tools/procedures/systems that could assist NHS boards and HPS in the prevention, identification and control of healthcare outbreaks and incidents.

If evidence for a particular research question is absent or of a very low quality, the NIPC consensus and steering group members will use their expertise to contribute to and agree recommendations based on their expert opinion.

NIPCM development process

The NIPCM development process in outlined in table 2 but can be viewed it its entirety on the NIPCM website http://www.nipcm.hps.scot.nhs.uk/resources/literature-reviews/development-process/

NIPCM literature review methodology

The NIPCM is currently underpinned by twenty-nine literature reviews; unlike the manual which is for staff closest to patients, these literature reviews are intended for use by infection control specialists; summarising the available evidence as well as highlighting research gaps. There are currently

Table 2
NIPCM development process

Stage	Process
Development of research questions	• Research questions are drafted by the scientists; • SNIC and NCIC review and finalise the research questions; • The questions are sent for consultation with the NIPC consensus and steering groups; • Comments are collated and research questions are finalised by the scientist(s), SNIC and NCIC.
Developing and performing searches	• Search strategies drafted by scientist(s) using the PICO framework; • Library services check and optimise (if necessary) the final search strategy for multiple databases; • Searches carried out and results exported into endnote and an excel database.
Screening and selection of articles	• 1st screen of title and abstract against inclusion/exclusion criteria; • Article retrieval; • 2nd screen of retrieved full texts; • All decision recorded in excel database.
Evidence appraisal and grading	• Included articles are critically appraised, graded and summarised in evidence tables.
Development of recommendations	• Scientist(s) synthesise draft recommendations based on the evidence identified; • SNIC and NCIC review and approve the draft recommendations.
Write-up of literature review	• A literature review summarising the identified evidence and recommendations is drafted by the scientist(s) • SNIC and NCIC approve the draft for consultation
Consultation	• A 4—6 week consultation with NIPC steering and consensus groups plus any topic experts is conducted • Comments returned are collated by an administrator • Scientist(s), SNIC and NICIC review the comments and agree/reject any changes • A record is made of all decisions on consultation comments for circulation to the consultation groups
Final sign-off, publication and communication	• A final draft with any required changes is produced by the scientist(s) for final sign-off by the NCIC; • A final version is formatted and published on the NIPCM website by the information officer; • Any changes to the NIPCM that are required are made by the information to coincide with publication; • Publication and any changes to practice is communicated to stakeholders using a weekly email digest and highlighted on the NIPCM website.

two methods in use for production of the NIPCM literature reviews; a single-person methodology and a two-person methodology. A summary comparison of the two methods is shown in table 3.

The majority of the currently published reviews have been produced using the single-person methodology. Reviews that are scheduled for update will typically be produced using the two-person methodology. A small number of the literature reviews identify little to no peer-reviewed, academic literature and are mostly based on existing UK policy and legislation; there is little benefit in carrying out these reviews using the two-person methodology and so a single-person method is used to conserve staff resource.

Development of research questions

All question sets are agreed by consultation with the NIPC steering and/or consensus group as well as relevant experts co-opted from healthcare, academia or other professional organisations. Additional research questions are also posed ad hoc if there is a need to address emerging infection control issues that have been identified by the NIPC steering group, or common themes emerging from stakeholder enquiries; these are refined and agreed using the same process.

Identifying evidence

A decision making algorithm is utilised by the responsible scientist(s) to enable a best available evidence approach to the literature search process (Figure 1.). This avoids duplication of effort and ensures the recommendations of the NIPCM are compliant with existing policy and legislation. It may not be necessary to carry out searches of academic literature, particularly if there is existing policy or legislation, national or international guidelines or systematic reviews and meta-analyses that are less than one-year-old.

Search strategies for literature reviews are initially developed by NIPC programme scientists using the PICO framework; these are further optimised by the HPS library service. A complete list of NIPCM search strategies is maintained in the published NIPCM methodology. [5].

As a minimum, the following electronic databases are searched for all relevant papers:

Table 3
Summary of single-person and two-person literature review methodology

Protocol/methodology	Single-person review	Two-person systematic review
Development of research questions	Consultation with NIPC steering and consensus groups — sign-off by NCIC	Consultation with NIPC steering and consensus groups — sign-off by NCIC
Performing searches	Lead reviewer only	Lead or supporting reviewer only
Screening and selection of articles	Lead reviewer only	Lead and supporting reviewer independently select articles for inclusion and agree by discussion
Evidence appraisal and grading	Lead reviewer only	Lead reviewer appraises all evidence and completes evidence tables, supporting reviewer completes a check of at least 30% of the appraisals and evidence tables
Write-up of literature review	Lead reviewer only	Lead reviewer only
Development of recommendations	Lead reviewer suggests recommendations for sign-off by the NCIC	Lead reviewer suggests recommendations, second author agrees the content before sign-off by the NCIC
Consultation	4—6 week consultation with NIPC steering and consensus groups plus any topic experts	4—6 week consultation with NIPC steering and consensus groups plus any topic experts
Maintaining and updating literature reviews and NIPCM	RSS feeds and monthly auto-alerts with any required changes to recommendations made in real-time. Quarterly evidence tables circulated to stakeholders and published online.	RSS feeds and monthly auto-alerts with any required changes to recommendations made in real-time. Quarterly evidence tables circulated to stakeholders and published online.

- Medline
- Embase
- Cinahl (Cumulative Index to Nursing and Allied Health Literature)
- The Cochrane Library (Cochrane DSR, DARE, CCTR, CMR, HTA, NHSEED)

Additional data bases may be included based on the specific topic at the recommendation of the Health Protection Scotland library service these are documented in the NIPCM methodology. [5].

Relevant policy, legislation, guidance documents or significant grey literature is also sought from online sources including (but not limited to):

- Scottish Government Health Department (SGHD);
- Department of Health and Social care (DHSC);
- World Health Organization (WHO);
- Centers for Disease Control and Prevention (CDC);
- Public Health England (PHE);
- European Centre for Disease Prevention and Control (ECDC);
- Society for Healthcare Epidemiology of America (SHEA);
- Association for Professionals in Infection Control and Epidemiology (APIC);
- National Resource for Infection Control (NRIC);
- SIGLE (Systems for the Information on Grey Literature in Europe).

First and second stage screening and selection of relevant articles is performed independently either by a single reviewer or by at least two reviewers. In a single-person review there is no cross-checking of included and excluded articles, in a two-person review the final list of included articles is agreed jointly; if agreement cannot be reached the final decision will be made by the lead nurse consultant in infection control (NCIC).

Titles and abstracts are reviewed by subject relevance (inclusion); the following exclusion criteria are then applied.

- Item is not applicable to health or social care settings;
- Item is focussed on compliance/promotion/monitoring or effectiveness of training;
- Item studies intervention(s) as part of a bundled approach;
- Item is appraised as having an unacceptable level of bias i.e. SIGN50 level 1- or 2-;
- Item is not available in English language;
- Item uses animal models of infection;
- Item was published outwith date limits.

Critical appraisal and grading of evidence

Identified studies and guidance documents are appraised and graded using the Scottish Intercollegiate Guidelines Network (SIGN) 50 critical appraisal checklists [6] and a modified version of the Appraisal for Research and Evaluation (AGREE) tool (available on request), [7] respectively (see tables 4 and 5). A lead reviewer critically appraises each study or guidance document, in two-person reviews a second reviewer carries out a check of a minimum 30% of the included studies. Errors or omissions are resolved by discussion, a final decision on any disagreements is made by the NCIC.

Development of recommendations

Recommendations for practice are made within the literature reviews and are based on an assessment of the extant

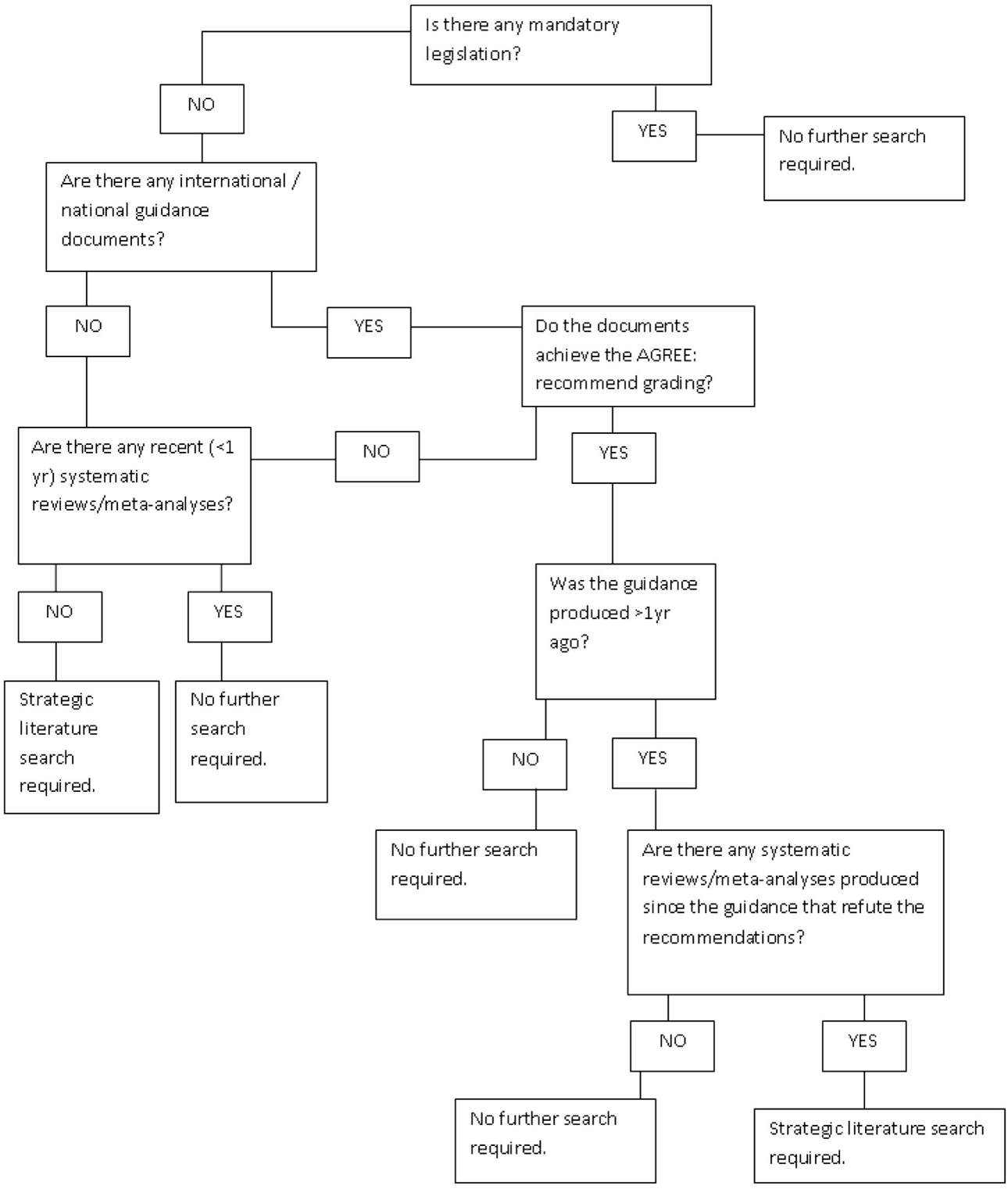

Figure 1. Decision making algorithm for literature searching.

professional and scientific literature. Following assessment of the extant scientific literature evidence tables are compiled summarising each item and discussing its impact on/contribution to the specified topic area. Evidence tables are used in conjunction with a considered judgment form to synthesize and grade draft recommendations based on the volume, consistency, applicability etc. of the available evidence. Final recommendations are given a grade to highlight the strength of evidence underpinning them, the NIPCM grades of recommendations are as shown in table 6.

All literature review recommendations are incorporated into the NIPCM. The recommendations are consolidated into practice statements to allow a streamlined presentation which is easier for staff nearest to patients to read, understand and

Table 4
SIGN 50 levels of evidence

Level of evidence	Descriptor
1++	High quality meta-analyses, systematic reviews of Randomised Control Trials (RCTs), or RCTs with a very low risk of bias
1+	Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++	High quality systematic reviews of case control or cohort studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series
4	Expert opinion, includes public health/ health protection/infection control guidelines published without a methodology

Table 5
AGREE grades of recommendation

Level of evidence	Descriptor
Strongly recommend	This indicates that the guideline has a high overall quality and that it can be considered for use in practice without provisos or alterations
Recommend	This indicates that the guideline has a moderate overall quality. This could be due to insufficient or lacking information in the guideline for some items. If provisos or alterations are made the guideline could still be considered for use in practice, in particular when no other guidelines on the same topic are available
Would not recommend	This indicates that the guideline has a low overall quality and serious shortcomings. Therefore it should not be recommended for use in practice

put into practice. Following a period of consultation, final recommendations are agreed by consensus; if consensus is not reached a final decision is taken to a vote overseen by the chair of the NIPC steering group.

Consultation and wider consultation

All new literature reviews, supporting tools and final chapters are required to undergo wider consultation (including external peer review) before publication. Wider consultation includes additional NHS Stakeholders and external organisations who are not involved in the development process. Literature reviews are disseminated via the NIPC steering or consensus group to appropriate professional bodies (supplement A) accompanied by a literature evaluation tool. Each member of the steering or consensus group is expected to collate and return the comments of the professional body/ organisation they represent. Collated comments are addressed by the literature review authors, HPS Senior Infection Control Nurse (SNIC) and NIPCM programme lead; all responses, actions taken etc. are recorded before the collated comments are anonymised and published on a secure microsite for consultation groups to access. If conflicting comments are received from the consultation these are discussed and resolved by the NIPC steering group.

Editorial independence and competing interests

The NIPCM and its associated literature reviews and tools are funded by the Scottish Government. The Scottish Government HAI policy unit is present at meetings of the NIPC consensus and steering groups; however, this forms part of the governance structure and the representative acts as an observer only i.e. they do not take part in consultations or the forming of recommendations. The representative also complies with the competing interest policy for completeness.

The NIPCM development process included a competing interests' policy to which all members (including chairs) of both the NIPC consensus and steering groups must adhere. Currently, no member of either group or any author of an NIPCM literature review has declared a competing interest.

Maintaining and updating the NIPCM

The NIPCM literature reviews (both methodologies) can be considered 'living literature reviews'. [8] The NIPCM is a 'live' document; it is under continual review using a defined, systematic process. The evidence base which underpins the NIPCM recommendations is monitored using monthly auto-alerts which utilise the search strategies detailed in the published NIPCM methodology; [5] and RSS feeds for the following organisations:

- ECDC (Publications; News; Events)
- CDC (MMWR; Emergency Preparedness and Response; Recent Outbreaks and Incidents; Emerging Infectious Diseases Journal)
- HICPAC
- Cochrane library

Table 6
Grading of recommendations[a]

Grade	Descriptor	Levels of evidence
Mandatory	'Recommendations' that are directives from government policy, regulations or legislation	N/A
Category A	Based on high to moderate quality evidence	SIGN level 1++, 1+, 2++, 2+, AGREE strongly recommend
Category B	Based on low to moderate quality of evidence which suggest net clinical benefits over harm	SIGN level 2+, 3, 4, AGREE recommend
Category C	Expert opinion, these may be formed by the NIPC groups when there is no robust professional or scientific literature available to inform guidance.	SIGN level 4, or opinion of NIPC group
No recommendation	Insufficient evidence to form a recommendation	N/A

[a] literature review published before October 2018 use the SIGN50 (1999–2012) ABCD system for grading recommendations; this will be phased out as reviews are updated.

- HSE (Health Services)
- WHO (News; Disease Outbreak news; Director General Speeches)
- NICE (Published Clinical Guidelines; Press Releases)
- Scottish Government (Health and Community Care; Public sector)
- UK Government (Public health England; Department of Health)
- ISD (latest Publications — Public Health; Research)

The responsible scientists (minimum of two) review all titles and abstracts to identify any evidence that supports, modifies or refutes the recommendations of the NIPCM. Any evidence identified which disagrees with current recommendations is subjected to immediate appraisal and inclusion in the relevant literature review following the NIPCM methodology; [5] changes are made to the NIPCM after consulting with the NIPC steering group. Any evidence identified which supports and does not change the current recommendations of the NIPCM is collated in an ongoing evidence table which is presented to the NIPC steering and consensus groups and published on the NIPCM website on a quarterly basis. [1] All identified evidence is subjected to full critical appraisal as per the NIPCM methodology and addition to the relevant literature review(s) during scheduled literature review updates (every 3 years).

Any changes or updates to the content of the NIPCM, its associated literature reviews or supporting tools are communicated to stakeholders via a weekly infection control digest (email); this is prepared and disseminated by the information officer and forms part of an overarching NIPC communications strategy. Changes are also highlighted on the 'latest news' section of the NIPCM website home page. This process is identical for reviews produced using the single- and two-person methodologies.

Comparison of major guideline methodologies

Table 5 provides a comparison of the methods used to produce the NIPCM to those used by major developers of guidelines for use in healthcare, public health and infection prevention and control:

- World Health Organisation; [9].
- The Society for Healthcare Epidemiology of America (SHEA); [10].
- Healthcare Infection Control Practices Advisory Committee (HICPAC); [11].
- Scottish Intercollegiate Guideline Network (SIGN); [12].
- National Institute for Health and Care Excellence (NICE); [13] and
- the epic project. [14–16].

All of the guidelines developers utilise a group of experts and stakeholders for oversight during the guideline development process, these are variably referred to as steering groups, guideline development groups, etc. The role of these groups vary, some are in addition to a team dedicated to reviewing the literature and developing recommendations and some have responsibility for the reviewing, extracting and grading evidence. In all cases these specialist groups had oversight at key stages of the guideline development such as scoping, developing research questions and search strategies, developing

recommendations and sign-off on the final guideline. The NIPC steering and consensus groups perform these roles for the NIPCM. A key difference compared to other guideline developers is that the NIPC steering group does not disband, therefore no additional time is required to recruit expert stakeholders to perform this function; there is also the benefit of organisational memory as all members are well versed in the process for developing the NIPCM and the content of the chapters. [5].

All of the guideline developers in table 7 use a systematic review methodology to underpin their guidelines i.e. they use explicit, predefined methods to identify, select, and critically appraise relevant evidence to answer clearly defined research questions. [9—16] Multiple databases are used for all literature reviews and always include MEDLINE, EMBASE, CINAHL and the Cochrane database as a minimum plus topic specific databases as required. First and second screening of articles is carried out by two reviewers independently in all methodologies with the exception of the NIPCM single-reviewer methodology. The processes for data extraction, appraisal and summarising are more varied; WHO, SHEA, SIGN and epic guidelines all use at least two independent reviewers to carry out these tasks, [9,10,12,14—16] whereas HICPAC, NICE and NIPCM methodologies all use a single reviewer with either a full or partial check by a second. [5,11,13] All methods use a defined process or tool to critically appraise the evidence identified; the GRADE system is used by WHO, NICE and HICPAC; [9,11] SIGN have their own system of critical appraisal tools and their methodology is also accredited by NICE; [12] both NIPCM [5] and epic guidelines [14—16] use AGREE [7] and SIGN [6] methods for appraisal of other guidelines and published literature, respectively. SHEA have their own checklist for appraising the quality of studies, however, its use is only suggested and it is not a requirement of the process. [10] With the exception of HICPAC the development of recommendations in all methodologies is guided by evidence summaries produced by those carrying out the literature review. These recommendations are then agreed by the guideline development/steering/expert group either with, [10,13,17] or without [9, 11,14—16] a process of targeted or open external consultation. When the single- and two-person NIPCM methodologies are compared the major difference is in the selection and appraisal of evidence, all other elements are the same; since no other guideline developer considered here uses a single-person methodology the two-person NIPCM methodology is likely to be the most acceptable to guideline consumers.

Generally, there is limited information available on the timescales involved in the stages of guideline development to compare the methodologies. Depending on the type and scope of the evidence review to be undertaken the time taken to produce a new or updated NICE guideline ranged from 12 to 27 months for NICE [13]; WHO suggest that the time required to produce a guideline may range from 9-12 months for a guideline with narrow scope to 2—3 years for a guideline with multiple research questions and de novo literature searches; [9] SHEA guidelines range from 18 to 40 months. [10] SHEA were the only guideline developer to place a limit of 40 months on the production of their guidelines, after this time approval to produce the guideline would need to be sought again. The first epic guidelines took around 3 years to develop and publish (1998—2001), [18] the literature reviews to underpin epic 2 were carried out in 2005 and published in early 2007, [15] similarly the second update was commissioned by the Department of Health in 2012 and epic3 was published in 2014. [14] The methodologies of SIGN and HICPAC do not provide a guide for literature review timescales.

All of the methodologies state the importance of regular review of the evidence base and update of the guidelines; however, most of the methodologies either do not specify a timeframe for review or have specified a timeframe which has not been achieved. No specific time period is required by the WHO methodology, [9] instead it is advised that guidelines 'be issued with a review date'. HICPAC guidelines are to be revised periodically, however, it is not clear how or if this is achieved. [11] The timeframe for updating SIGN guidelines varies by topic. [12] NICE guidelines are checked every 5 years at a minimum. The epic guidelines stated that the guidelines would be updated within a two-year timeframe, however, there were gaps of 6 and 7 years between the epic and epic2 and epic2 and epic3, respectively. [14—16,18] The NIPCM literature reviews have a considerably shorter timeframe for producing recommendations. Initial reviews carried out using the two-person systematic review methodology can be expected to take 4—6 months from scoping to publication, an update of these reviews would take up to 3 months but each reviewer would be working on around three reviews at a time i.e. publishing three per quarter. This enables a complete update of all NIPCM literature reviews to be carried out every three years. These three yearly updates are in addition to ad hoc minor changes as a result of stakeholder feedback or publication of new evidence which necessitates a change to practice.

In contrast to the other guidelines identified, the NIPCM is unique in that it is the only 'live' infection control guidance currently published on a public forum. The ethos underpinning the NIPCM is to make IPC practice guidelines accessible to all care staff that supports a common understanding; making it easy to do the right thing, every time, for every patient, in every care area. This once for Scotland (and Wales) approach not only promotes collaboration and engagement, releasing IPCT time to improve staff knowledge and patient confidence in the eradication of avoidable infections, but has helped Scotland to align practice with educational resources, monitoring, quality improvement and scrutiny.

Discussion

There is an inherently high risk of bias when producing infection control guidelines, [19] the evidence base is largely formed of observational studies and frequently uses surrogate measures such as microbial contamination to assess effectiveness of interventions rather than outcomes such as infection rates. It is therefore essential that other sources of bias are controlled at all other stages of guideline development e.g. through wide consultation with stakeholders and topic experts. In describing the single- and two-person methodologies for producing the NIPCM and comparing these to the methods of other major guideline producers we hope to have demonstrated that both methodologies have a low risk of bias and are able to produce recommendations that are risk-based, proportionate, practical and in a format that is applicable and accessible to all care staff.

Whichever method is used there are of course implications for the resource (staff and time) required; in comparison to

Table 7
Overview of guidance/guideline developer methods

	WHO [9]	SHEA [10]	HICPAC [11]	SIGN [12]	NICE [13]	EPIC [14—16]	NIPCM [5] Single-person methodology	NIPCM [5] Two-person methodology
Development of research questions by a defined group of experts/key stakeholders?	✓	✓	✓	✓	✓	✓	✓	✓
Evidence searches performed across multiple databases	✓	✓	✓	✓	✓	✓	✓	✓
Screening and selection of articles performed by more than one person?	✓	✓	✓	X	✓	✓	X	✓
Data extraction carrie out independently by more than one reviewer?	✓	✓	✓*	✓	✓*	✓	X	✓*
Evidence appraised and graded using an appropriate method/recognised tool(s)?	✓	? In-house method is used but not consistently	✓	✓ SIGN methodology (NICE accredited)	✓	✓	✓	✓
Evidence tables/ summaries produced and reviewed by defined group of experts?	✓	? Only required if the guideline is to be submitted to the National Guidelines Clearing House	✓	✓	✓	✓	✓	✓
How are recommendations developed?	Formulated by the guideline development group with support from the steering group	The writing panel agree the recommendations by formal consensus	Single reviewer writes recommendations second reviewer then reviews these. Expert panel and HICPAC provide regular feedback	Developed by the guideline development group using considered judgement forms	Developed by the guideline committee following documented discussion	Formulated by the guideline advisory group using evidence tables	Recommendations are drafted by HPS (scientists, senior infection control nurses and nurse consultants in infection control)	Recommendations are drafted by HPS (scientists, senior infection control nurses and nurse consultants in infection control)
How are recommendations approved?	Agreed by the guideline development group	Agreed by consultation with the GLC and external stakeholders	HICPAC members vote to approve the final guideline	Reviewed through open consultation and targeted peer review	Stakeholder consultation: these are open but registered stakeholders are notified in advance	Finalised through consultation with key stakeholders	Approved by consultation with stakeholders via the consensus and/or steering group	Approved by consultation with stakeholders via the consensus and/or steering group

(*continued on next page*)

Table 7 (*continued*)

	WHO [9]	SHEA [10]	HICPAC [11]	SIGN [12]	NICE [13]	EPIC [14—16]	NIPCM [5] Single-person methodology	NIPCM [5] Two-person methodology
Are there timeframes for updating the guideline/literature review?	X A specific date is not required	✔ Every 4 years	✔ Not timelined, revised periodically/ at the request of the HICPAC	✔ Varies	✔ Guidelines are checked every 5 years at a minimum, surveillance is in place to identify if guidelines require updating sooner than this.	✔ Both EPIC 2 and EPIC 3 stated a two year timeframe for update of the evidence; however, this has not been achieved.	✔ Continual review of evidence base full updates every three years (unless evidence emerges that changes recommendations)	✔ Continual review of evidence base plus full updates every three years (unless evidence emerges that changes recommendations)
How is guideline production funded?	Varies, may be funders may include governmental or non-governmental organisations (e.g. united nation), industry or charitable foundations ad hoc	unknown	CDC funded, ad hoc	Core funding from NHS Healthcare Improvement Scotland (indirectly via Scottish Government)	Department of Health and Social Care, England	Department of Health and Social Care, England. Ad hoc	Core funding from Scottish Government	Core funding from Scottish Government
Are conflicts of interest declared?	✔	✔	✔	✔	✔	✔	✔	✔

•Single reviewer performs data extraction/critical appraisal this is then checked by a second reviewer.

other guideline methodologies both of the NIPCM methodologies have much shorter timeframes. The NIPCM literature reviews are living literature reviews i.e. they are updated in real time in response to changes in evidence and/or practice, this is in addition to a three-year update cycle and so work on these is continuous. When literature reviews for guidelines are outsourced and/or require substantial additional funding and personnel to carry them out it is difficult if not impossible to maintain this level of activity. Unlike most other guideline developers, the NIPC steering group does not stand down or disband after production of a new or updated literature review and so there is no need to convene a new committee/working group for each piece of guidance. The NIPCM is supported by a permanent full-time team of scientists, infection prevention and control nurses and support staff with ring-fenced funding, therefore, the time taken by other organisations to source funding, recruit reviewers and experts is circumvented.

Conclusions

Both NIPCM methodologies are robust and are able to rapidly produce evidence-based recommendations that are current, risk-based, proportionate and rapidly adaptable to new and emerging infection prevention and control risks, practices or products. The two-person methodology is the 'gold standard' to which we aspire, therefore it is intended that all of the NIPCM literature reviews will be repeated using the NIPCM two-person methodology. It is planned that this work will be completed by the end of 2021, however, it is not possible to predict what new challenges may arise in this time e.g. emerging infection threats such as novel coronavirus which take precedence and may divert resource, and it is possible that this may take several years. In the interim however, there should be no concern regarding the methods used to produce the existing single-person literature reviews or the resulting recommendations within the NIPCM.

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Ethical approval

Ethical approval not required.

Declaration of Competing Interest

None declared.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.infpip.2020.100058.

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