Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

Postprint version	:	1.0
Journal website	:	https://academic.oup.com/intqhc/advance-article-abstract/doi/10.1093/intqhc/mzac033/6571667?redirectedFrom=fulltext&login=false
Pubmed link	:	https://pubmed.ncbi.nlm.nih.gov/35445264/
DOI	:	10.1093/intqhc/mzac033

This is a Nivel certified Post Print, more info at nivel.nl

Designing Clinical Indicators for Common Residential Aged Care Conditions and Processes of Care: The CareTrack Aged Development and Validation Study

Peter D Hibbert [1 2 3], Charlotte J Molloy [1 2 3], Louise K Wiles [1 2 3], Ian D Cameron [4], Leonard C Gray [5], Richard L Reed [6], Alison Kitson [7], Andrew Georgiou [1], Susan J Gordon [7], Johanna Westbrook [1], Gaston Arnolda [1], Rebecca J Mitchell [1], Frances Rapport [1], Carole Estabrooks [8], Gregory L Alexander [9], Charles Vincent [10], Adrian Edwards [11], Andrew Carson-Stevens [11], Cordula Wagner [12], Brendan McCormack [13], Jeffrey Braithwaite [1],

1 Australian Institute of Health Innovation, Macquarie University, Sydney, New South Wales, Australia.
2 IIMPACT in Health, Allied Health and Human Performance, University of South Australia, Adelaide, South Australia, Australia.
3 South Australian Health and Medical Research Institute, Adelaide, South Australia, Australia.
4 John Walsh Centre for Rehabilitation Research, Kolling Institute, Faculty of Medicine and Health, University of Sydney, St Leonards, New South Wales, Australia.
5 Centre for Health Services Research, Faculty of Medicine, The University of Queensland, Brisbane, Queensland, Australia.
6 Discipline of General Practice, College of Medicine and Public Health, Flinders University, Bedford Park, South Australia, Australia.
7 Caring Futures Institute, College of Nursing and Health Sciences, Flinders University, Bedford Park, South Australia, Australia.
8 Faculty of Nursing, University of Alberta, Edmonton, Alberta, Canada.
9 Sinclair School of Nursing, University of Missouri, Columbia, USA.
10 Department of Experimental Psychology, Radcliffe Observatory, University of Oxford, Oxford, England, United Kingdom.

Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

[11] PRIME Centre Wales & Division of Population Medicine, Cardiff University, Heath Park, Cardiff, Wales, United Kingdom.
[12] Netherlands Institute for Health Services Research, Amsterdam University Medical Center, Utrecht/Amsterdam, The Netherlands.
[13] School of Health Sciences, Queen Margaret University, Edinburgh, Scotland, United Kingdom.

Abstract

Background

People who live in aged care homes have high rates of illness and frailty. Providing evidence-based care to this population is vital to ensure the highest possible quality of life. This study (CareTrack Aged, CT Aged) aimed to develop a comprehensive set of clinical indicators for guideline-adherent, appropriate care of commonly managed conditions and processes of care in aged care.

Methods

Indicators were formulated from recommendations found through systematic searches of Australian and international clinical practice guidelines (CPGs). Experts reviewed the indicators using a multi-round modified Delphi process to develop consensus on what constitutes appropriate care.

Results

From 139 CPGs, 5,609 recommendations were used to draft 630 indicators. Clinical experts (n=41) reviewed the indicators over two rounds. A final set of 236 indicators resulted, mapped to 16 conditions and processes of care. The conditions and processes were admission assessment; bladder and bowel problems; cognitive impairment; depression; dysphagia and aspiration; end of life/palliative care; hearing and vision; infection; medication; mobility and falls; nutrition and hydration; oral and dental care; pain; restraint use; skin integrity; and sleep.

Conclusions

The suite of CT Aged clinical indicators can be used for research, assessment of quality of care in individual facilities and across organisations to guide improvement, and to supplement regulation or accreditation of the aged care sector. They are a step forward for Australian and international aged care sectors, helping to improve transparency, so that the level of care delivered to aged care consumers can be rigorously monitored and continuously improved.

Background

Whilst much focus of quality improvement, research, and implementation has been on acute and primary health systems in the last 20 years, care for older adults in residential settings or nursing homes (residential aged care facilities, RACFs) has been less prominent. This is despite major quality and safety issues being frequently encountered in aged care such as neglect of wounds and incontinence, failure to recognise malnutrition and provide nutritional support and poor management of medication, falls, and restraint practices (1-3) .

In light of these issues, reviews into aged care safety and quality in Australia (2-7), the UK (8, 9) and Canada (10), for example, repeatedly highlight the need for more rigorous mechanisms for monitoring quality and safety and the importance of benchmarking and audit using clinical indicators. Lack of these not only leads to a fundamental deficit in transparency (3); it also means poor standards of care are not identified and opportunities to improve both processes and overall

care are missed (2).The use of clinical indicators is a key component in ensuring continuous quality improvement and providing transparency through benchmarking at the level of both the facility and the whole system.

Clinical indicators can be described using a Donabedian Framework, categorising them as structure, process, and outcome (11). Structure level indicators mainly measure the systems and staff that are in place and are often used as the basis of assessing facilities against standards such as for accreditation or regulation (11). However, adherence to these standards does not guarantee RACFs will deliver appropriate care to consumers (2). Outcome indicators measure the health or well-being (or its change) of a RACF resident (12). Advantages of outcomes indicators are face validity and focussing on the longer term goals of the system (13). Their disadvantages are that they are difficult to attribute to particular actions as many variables may affect an outcome and considerable risk adjustment may be required for case-mix reasons (13). In a review of indicators in eleven countries, the majority were outcome and five of the 11 countries used the Resident Assessment Instrument (RAI) minimum data set (MDS) (12). In Australia, the National Aged Care Quality Indicator Program involves the mandatory collection of and reporting on five outcome indicators, focussing on pressure injury, use of physical restraint, unplanned weight loss, falls and major injury and medication management (14). Since mid- 2021, all RACFs are required to report their data against these indicators to the Australian government (14). RACFs can compare their results against similar services via a secure portal; high level de-identified results are available for the public.

In this research, we are interested in care that is delivered to residents that is in accordance with the evidence, embodied in process indicators. These are defined as indicators which assess the degree to which health care adheres to processes that are proven by scientific evidence, professional consensus to affect health, or that concur with patient preference (15). There are fewer comprehensive sets of process indicators developed and in use across the world internationally compared to outcome indicators, underlying the importance of this work (12). The advantages of process indicators are that they are under the control of the professionals and managers running the facility and the results give a clear indication of what is being done well and how it could be done better. They allow comparison of existing practices against evidence based or best practice standards and are commonly used to drive improvement initiatives (11). Compared to outcome indicators, less weighting and risk-adjustment is necessary (16), and therefore they are likely to be collected and report on in a timely manner and are easier to analyse.

Interpretation of clinical indicators across a sector can have far-reaching implications in terms of reporting, public disclosure and reputation, and pay-for-performance, so it is vital that indicators are based on scientific principles. The principles guiding indicator development include the adoption of a transparent and systematic approach (17) that incorporates both evidence from clinical practice guidelines (CPGs) and independent assessment by experts such as by a Delphi process(18) so as to arrive at a set of indicators that are comprehensive, reliable and valid. The indicators should be responsive to change over the time period of measurement, be attributable to the organisation or service and be under an organisation's ability to influence to improve (17) The indicators should be based on a conceptual framework that sets out the rationale and design principles for the indicator set and which links to the wider health system context.

Building on work completed previously in both the CareTrack Australia (19, 20) and CareTrack Kids (21-23) studies, the CT Aged study aimed to develop a comprehensive set of clinical process indicators for appropriate care of commonly managed conditions and processes of care in aged care using robust scientific principles.

Methods

The methods used for developing and refining the CT Aged indicators are based on the established methodology used in previous studies of quality of healthcare in adults (24, 25) and children (21-23). These in turn drew on methods from the United States (US) (24, 25). The definitions used in the CT Aged study are in Box 1.

Box 1. CareTrack Aged study definitions (19, 26)

- A **resident** is a person aged 65 years and older living in a RACF.
- **Condition** refers to acute (e.g., pressure injuries, falls) and chronic (or long term) conditions (e.g., dementia, incontinence) or care processes (e.g., medication management, oral and dental care).
- **Healthcare provider** includes any healthcare professional delivering services to residents within a RACF, and whose scope of practice is covered by identified CPG recommendations.
- **Appropriate care** is that which is considered to be evidence- or consensus-based (taken from CPG recommendations and ratified by a panel of experts in Australia) in the RACF context in which it was delivered in the years 2019 and 2020.
- **A clinical indicator** is a measurable component of a standard or guideline, with explicit criteria for inclusion, exclusion, time frame and setting. In the context of this study, an indicator is relevant for Australian practice during 2019 and 2020. Compliance with each indicator is scored 'yes' or 'no', if the indicator is deemed eligible for assessment (i.e., meets all inclusion criteria, and does not meet any exclusion criterion).
- An **encounter** is an interaction between a resident and a healthcare provider defined by the inclusion criteria of the clinical indicators.

As outlined in our protocol, we determined which conditions and processes of care were to be included in the study (26). Fifteen conditions and processes of care were identified for inclusion, through use of published research, prevalence and burden of disease data, CPGs, and indicator sets relevant to RACF settings (26).

Indicators representing appropriate care for each of these conditions were developed using a four-stage approach: systematic search, source and quality appraise relevant CPGs; select, draft and format proposed clinical indicators; review draft clinical indicators via a modified Delphi approach; and finally, ratify and validate clinical indicators.

Stage 1: Systematically search, source, and quality appraise relevant clinical practice guidelines

A systematic search was undertaken for national-level Australian and international CPGs relevant at the time of the search (6th March 2019). Two research team members conducted the searches and selected relevant CPGs (AD (see acknowledgements), CJM), with any discrepancies resolved through discussion with a third team member (LKW). Full details of the search strategy are available in Additional File 1 of Supplementary material. Each CPG was also independently appraised by two reviewers (AW, MC – see acknowledgements) using the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument (27).

Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

Stage 2: Select, draft and format proposed clinical indicators

Recommendations were extracted verbatim from CPGs along with supporting references, grade of recommendation and level of evidence (if available) and compiled in a Microsoft Excel spreadsheet. Similar recommendations were grouped together to minimise duplication. Recommendations were excluded if they met any of four criteria:

- Out of scope of the study (e.g., structure or outcome recommendations).
- Guiding statement without recommended action.
- Low level of strength/certainty of the wording of the recommendation (e.g., may, could, consider)
- Low likelihood of information being documented in the resident's care record.

The remaining indicators were described in a structured and standardised format, commencing with inclusion criteria (e.g., condition, phase of care [e.g., at diagnosis]), followed by the compliance action (e.g., the recommended appropriate care) (see box 2) (23, 26).

Box 2. Example indicator format (inclusion criteria in italics, compliance action underlined

- Residents who have dementia <u>should have a current care and support plan</u>
- Residents prescribed benzodiazepines OR antipsychotics <u>should have a written tapering plan</u>

Stage 3: Review draft clinical indicators using a modified Delphi process

Australian-based aged care experts were recruited to ensure wide-ranging knowledge and multidisciplinary experience of the field, through members of the research team and their extended professional networks (purposive-opportunistic sampling). All experts were required to complete a Conflict of Interest (COI) declaration (28) The experts completed two rounds of review, with the aim to have the indicators for each condition independently reviewed by at least three experts.

The first round was completed via an online survey platform (Qualtrics, Provo, UT, USA), and utilised review criteria based on methods from previous US and Australian studies (20, 22, 24, 25). The experts scored each indicator using one of three responses (Yes, No, Out of my scope of practice) against three key criteria: feasibility, acceptability, and impact (Box 3). They were also asked to score the appropriateness of each indicator on a nine-point Likert scale (9=highly appropriate, 1=not at all appropriate; Box 4) and provide any additional comments. A second-round external expert review was undertaken with experts who had completed the round one review.

Stage 4: Ratify and validate clinical indicators

Following each round of external expert review, research group members (PH, LKW, CM, AW) collated the feedback and revised each indicator. Indicators with an average appropriateness score of less than 7, or a majority score of a "No" across any of the scoring criteria were flagged for exclusion. Indicators with more than three inclusion criteria, or indicators containing a 'second-line' or 'follow up' treatment were also flagged for exclusion, as these were likely to have a lower prevalence in RACF settings and compliance can be more complicated and difficult to conclusively determine. For indicators where there was no clear consensus from the experts the indicators were referred to study chief investigators who currently work as clinical geriatricians (LG, IC) or general practitioners (RR) in RACFs for further review, ratification, and validation. Finally, the research group

members clarified wording and created or confirmed definitions for all concepts within the indicators in close consultation with the study chief investigators.

- **Box 3: Information provided to reviewers to assist with scoring clinical indicators**

Indicator Feasibility (F)

- Multiple eligibility criteria may suggest non-feasibility, as more criteria is likely to lead to fewer patients being assessable for the indicator
- Compliance can be determined preferably from one of the following time periods:
  - on admission
  - within a 90-day period
- • Likely to be documented in the RACF record
  – e.g., indicators associated with lifestyle or exercise advice are less likely to be documented

Indicator Acceptability (A)

- Level of evidence or grade of recommendations vs consensus-based
- Non-Australian CPG recommendations – relevance to Australian context
- Non-national Australian CPG recommendations
  – e.g., state-based, or organisational
- Recommendation is made in more than one CPG
- Reflects current and "essential" (i.e., independent of resources) Australian RACF care.

Indicator Impact (I)

- "High impact" on the resident in terms of domains of quality
  – i.e., safety, effectiveness, resident experience, or access
- "High impact" within Australian RACF settings
  – e.g., what will be the frequency/ prevalence of presentation

Indicator Appropriateness (A)

A procedure or treatment is considered to be appropriate if:

"The expected health benefit (e.g., increased life expectancy, relief of pain, reduction in anxiety, improved functional capacity) exceeds the expected negative consequences (e.g., mortality, morbidity, anxiety, pain, time lost from work) by a sufficiently wide margin that the procedure is worth doing, exclusive of cost." (29, 30)

Results

Stage 1: Systematic search for, sourcing and quality appraisal of relevant CPGs

After screening and full text assessment of CPGs, initial searches found 236 eligible CPGs published between the years 2008 to 2018 inclusive (Figure 1). Due to the large number of CPGs, this date range was subsequently narrowed to 2013-2018 (except for the condition 'Infection' where small (n=4) numbers of CPGs were available between 2013-2018). After further searches and full text assessment of CPGs, the narrowed range of years resulted in 139 CPGs being included (Additional File 2). Quality appraisal for all included CPGs (including those added in stage 3), using the AGREEII tool

gave a mean overall score for all CPGs of 3.3 (out of 7) (SD=1.3). A summary of results is reported in Additional File 3.

Stage 2: Select, draft and format proposed clinical indicators

Of the 5,263 recommendations extracted from the initial CPGs, two-thirds (n=3,473, 66%) were excluded during initial review against inclusion criteria by the researchers (PDH, LKW, CJM). The remaining recommendations (n=1,790) were used to draft 630 initial indicators (Figure 2), to be circulated to the expert review panels.

Stage 3: Review draft clinical indicators via a modified Delphi process

Forty-one reviewers completed the round 1 external review process and 83% (n=34) of these completed round 2. Professional characteristics of the reviewers is presented in Table 1. For the external review there were a mean of four reviewers per condition (range 1-6).

[Table 1]

Stage 4: Ratify and validate clinical indicators

After the first external review round 59% (n=370/630) of initial indicators were excluded (Figure 2). Over half (n=196, 53%) of excluded indicators included feasibility as a reason for exclusion, which included issues around documentation, measurability, and multiple or unclear eligibility or compliance actions. Five additional CPGs were also identified and included in round two (Figure 1). Of 295 recommendations extracted from these additional CPGs, 39% (n=114) were incorporated into indicators. Where possible these were incorporated into existing indicators, however eight new indicators were formed from 13 recommendations. These changes combined with the merging, and splitting of other indicators, as well as the compiling of all relevant admission indicators into their own condition (therefore making 16 conditions in total), resulted in 256 unique indicators to be reviewed in round 2. In the second-round review 92% (n=236) of indicators were approved for inclusion in the final indicator set. The number of indicators by round of review by condition are reported in Additional File 4. Most indicators related to capturing information about under-use in RACFs (n=229, 97%), with the remainder being over-use. The number of final derived indicators is presented in Table 2. The full set of indicators is reported in Additional File 5.

[Table 2]

Discussion

Statement of principal findings

As part of the CT Aged study, we reviewed and distilled 5,609 recommendations from 139 CPGs to select and create 236 indicators mapped to 16 conditions in aged care. The methodology employed a transparent modified Delphi process with 41 participating experts, aiming to contextualise the recommendations of published CPGs to the residential aged care setting, and therefore capture both research evidence and expertise. This is one of the first studies internationally to develop a comprehensive set of quality indicators across multiple conditions for RACFs using a robust methodology and set of scientific principles. These indicators are designed to be used in the Australian aged care sector and internationally.

Strengths and limitations

There are several limitations to the study findings, related to indicator scope, indicator selection, and reviewers. First, for pragmatic reasons an inclusion criterion for the indicator set is residents 65 years or older; therefore, for the 2.6% of residents in Australian RACFs who are younger than 65 years old, they may not be directly applicable. Second, the final set of indicators was created using recommendations relevant to 2019-2020, with priority given to Australian publications where possible. This may limit the applicability and generalisability of the indicators to other contexts; however, having also reviewed international CPGs, we view the CT Aged indicator set as broadly applicable internationally. The indicators are also a product of the CPGs from which they originated, the majority of which were consensus-level recommendations, and whilst the quality of CPGs was assessed, no guidelines were excluded on this basis. The timing of the systematic searches for guidelines in 2019 was prior to the COVID-19 pandemic, and therefore indicators related to prevention, control, and management of COVID are not represented. These will need to be incorporated in the next version. Third, the indicators were reviewed by experts who chose to be involved in the study, and who were not randomly selected to participate. They were chosen to ensure a wide multidisciplinary field of experts was involved, however this may have skewed the sample and resulted in self-selection bias. While the number of reviewers was not high compared to similar studies and methodologies (22, 30) potentially affecting the representativeness of feedback, the experts' and chief investigators' experience and expertise in both geriatric care and scientific methodologies, potentially mitigates this limitation.

Interpretation within the context of the wider literature

The effort of extracting indicators and time required of the experts to establish a comprehensive set of indicators was substantial. However, if the indicators are to remain contemporary, then they need to be periodically reviewed and updated. "Living" systems for ensuring guidelines remain current are being piloted and used and a similar mechanism could apply to indicators (31). Funding this ongoing development process remains a challenge for the research team.

The primary source of the indicators was recommendations from CPGs complemented by independent expert input. However, there are other sources of evidence, including qualitative syntheses of experiences of residents and carers which are being incorporated into the development of guidelines (32). These were not included as one of our data sources but could be considered in further iterations of the indicators. Qualitative syntheses of resident's experiences can inform balancing health benefits and harms, human rights, sociocultural acceptability, equity, and non-discrimination (33) – all important principles for a high quality aged care service. A set of indicators incorporating qualitative syntheses of experiences of residents would then represent the clinical evidence as well as the wishes and needs of residents and carers.

Implications for policy, practice and research

The CT Aged study indicators have three primary uses – research, quality improvement, and quality assurance. First, they can be used to undertake a population-level study of appropriateness of care delivered to residents, as is being conducted in the next phase of the CT Aged study (26). Related to this, using the indicators for research to understand the local uptake or variation in appropriateness of care and, particularly, local organisational factors that may impact on this uptake is important for systematic and spread of improvement. Second, at the level of a RACF or organisation, indicators can be used to undertake audits and for monitoring improvement. These audits are likely to be undertaken with a single condition i.e., one of the 16 conditions identified for CT Aged. We envisage that such audits will most likely be triggered by a concern that care in one condition may not be

optimal, such as pressure ulcers or falls. Auditing the indicators will enable a facility to undertake a detailed exploration into areas of the care pathway which may need improvement. Alternatively, the audit of indicators in a single condition may be part of a quality improvement program of work by facilities, or across multiple facilities via a breakthrough collaborative or community of practice. Third, organisations responsible for accrediting, regulating, or funding aged care sectors may use these indicators to complement their extant assurance processes to collect quality indicators in a structured manner and to assess the quality of care being delivered.

The most frequent reason the expert reviewers excluded indicators was feasibility. When indicators are excluded based on feasibility there is a potential to skew what is deemed 'appropriate care' towards the care we are expecting to be documented rather than the care which should be delivered as best practice. An Australian government Senate inquiry (1) identified issues with poor medical record keeping practices within RACFs. The inquiry touched on issues such as continued use of paper medical records in many RACFs, and lack of ability to share information between external providers such as general practitioners (GPs) and allied health professionals with the RACF. The inquiry noted that these aspects are likely to have significant impact on quality of care. A first step to addressing some of these issues is improving the detail and consistency in record keeping, as well as the use of electronic systems that enable sharing of information between multidisciplinary teams across the spectrum of care, including primary and community care and hospitals.

Another potential criticism of the CT Aged indicator development is that 236 indicators is too many for aged care. In a world dominated by managerialism, is there too much measurement and burden on facilities and not enough action? A counter to this is that the complete set of indicators is not meant to be for routine use but applied to single conditions, periodically for quality improvement or assurance. We also intend to undertake testing on the indicators to determine which can be electronically searched for efficient extraction to reduce the burden of data collection on organisations. Additionally, refining of indicators over time may be achieved by explicitly and conceptually linking each to an outcome indicator of interest, thereby prioritising those with the greatest potential impact on care.

This paper reports on the CT Aged indicator development and validation process with experts. The next stage of our research (26) will involve collecting information from resident records in aged care homes. This ongoing research will test their feasibility in manual and electronic collection and their performance to make meaningful comparisons among facilities or over time within a facility.

Conclusions

The 236 quality indicators developed across 16 conditions represent the evidence-based care that clinical guidelines and experts agreed should be delivered to aged care consumers in Australia, with the potential for global impact. They can be used for research, locally in facilities to guide improvement and across facilities to benchmark care, and to existing initiatives contributing to registration or accreditation across the whole aged care sector. The CT Aged indicators are a step forward for Australian and international aged care sectors to improve transparency, so the level of care delivered to one of the more vulnerable groups in society, aged care residents, is rigorously monitored and continuously improved.

Acknowledgements:

We would like to thank Anthea Worley (AW) and Matthew Crocker (MC) for the extraction of recommendations and quality appraisal of guidelines, and AW for assistance with the initial drafting of indicators. Thanks to Anita Deakin (AD) for assisting with running the initial searches. We gratefully

acknowledge all the reviewers involved in the indicator review process: Sharon Bentley; Ellen Burkett; Lidia Conci; Rachel Davey; Sebastian Doeltgen; Olivia Farrer; Sue Gordon; Jane Graham; Graham Harding; Bronwyn Hemsley; Sarah Jeong; Susan Kalff; Susan Kurrle; Adrienne Lewis; Kwang Lim; Kim Lind; Lee-Fay Low; Stephen MacFarlane; Nigel McGothigan; Peta McVey; Roslyn Millar; Rebecca Mitchell; Eimear Muir-Cochrane; Joanne Murray; Sharon Oberstein; Nancye Peel; Dimity Pond; Lisa Pont; Magda Raban; Carmen Sanchez; Emma Scanlan; Cathie Sherrington; Margie Steffens; Paul Varghese; Kate White; Joanne Wood; Narelle Wood; Alison Yaxley; David Yu.

Funding:
This work was supported by National Health and Medical Research Council Project Grant APP1143223.

Contributorship:
JB and PH initiated the project and led the NHMRC grant proposal. JB, PH, IC, AK, RR, AG and LG co-led all aspects of the design. CJM and LKW coordinated and led the indicator development process. CJM and PH did the first drafting of the manuscript. LKW helped to write the manuscript. All authors actively contributed to the research project and reviewed manuscript revisions.

Ethics and other permissions:
The study was approved by the Macquarie University Human Research Ethics Committee (5201829374576).

Conflict of interests:
No known conflict of interests.

Data availability:
Data beyond that contained within the report may be obtained from the corresponding author on request.

References

1. The Senate Community Affairs References Committee. Effectiveness of the Aged Care Quality Assessment and accreditation framework for protecting residents from abuse and poor practices, and ensuring proper clinical and medical care standards are maintained and practised: Final Report. Canberra, Australia: Commonwealth of Australia; 2019.
2. Groves A, Thomson D, McKellar D, et al. The Oakden Report. Adelaide, Australia: SA Health, Department for Health and Ageing; 2017.
3. Royal Commission into Aged Care Quality and Safety. Interim Report: Neglect. Canberra, Australia: Commonwealth of Australia; 2019.
4. Productivity Commission. Caring for Older Australians, Inquiry report No.53. Canberra, Australia: Commonwealth of Australia; 2011.
5. House of Representatives Standing Committee on Health Aged Care and Sport. Report on the inquiry into the quality of care in residential aged care facilities in Australia. Canberra, Australia: Commonwealth of Australia; 2018.
6. Campbell Research and Consulting. Evaluation of the impact of accreditation on the delivery of quality of care and quality of life to residents in Australian Government subsidised residential aged care homes, Final Report. Canberra, Australia: Commonwealth of Australia; 2007.

7. Carnell K, Paterson R. Review of National aged care quality and regulatory processes. Canberra, Australia: Australian Government Department of Health; 2017.
8. British Geriatrics Society. Ambitions for change: healthcare in care homes. London, England: British Geriatrics Society; 2021.
9. Ismail S, Thorlby R, Holder H. Focus on: social care for older people. London, England: The Health Foundation and Nuffield Trust; 2014.
10. Gillese E. Public enquiry into the safety and security of residents in the long-term care homes system. Toronto, Canada: The Long-term care homes public enquiry; 2019.
11. Donabedian A. The Quality of Care: How Can It Be Assessed? JAMA. 1988;260(12):1743-8.
12. Caughey GE, Lang CE, Bray SC, et al. International and National Quality and Safety Indicators for Aged Care. Report for the Royal Commission into Aged Care Quality and Safety. Adelaide, Australia: South Australian Health and Medical Research Institute; 2020.
13. Hibbert PD, Saeed F, Taylor N, et al. Can benchmarking Australian hospitals for quality identify and improve high and low performers? Disseminating research findings for hospitals. Int J Qual Health Care. 2020;32(Supplement_1):84-8.
14. Australian Government Department of Health: My Aged Care. National Aged Care Mandatory Quality Indicator Program Manual. Canberra, Australia: Australian Government Department of Health; 2019.
15. Rubin HR, Pronovost P, Diette GB. The advantages and disadvantages of process-based measures of health care quality. International journal for quality in health care : journal of the International Society for Quality in Health Care. 2001;13(6):469-74.
16. Lilford R, Mohammed MA, Spiegelhalter D, Thomson R. Use and misuse of process and outcome data in managing performance of acute medical care: avoiding institutional stigma. Lancet (London, England). 2004;363(9415):1147-54.
17. Kötter T, Blozik E, Scherer M. Methods for the guideline-based development of quality indicators--a systematic review. Implement Sci. 2012;7(1):21.
18. Runciman WB, Coiera EW, Day RO, Hannaford NA, Hibbert PD, Hunt TD, Westbrook JI, Braithwaite J. Towards the delivery of appropriate health care in Australia. Med J Aust. 2012;197(2):78- 81.
19. Hunt TD, Ramanathan SA, Hannaford NA, et al. CareTrack Australia: assessing the appropriateness of adult healthcare: protocol for a retrospective medical record review. BMJ Open. 2012;2(1):e000665.
20. Runciman WB, Hunt TD, Hannaford NA, et al. CareTrack: assessing the appropriateness of health care delivery in Australia. Med J Aust. 2012;197(2):100-5.
21. Braithwaite J, Hibbert P, Jaffe A, et al. Quality of Health Care for Children in Australia, 2012- 2013. JAMA. 2018;319(11):1113-24.
22. Wiles LK, Hooper TD, Hibbert PD, et al. Clinical indicators for common paediatric conditions: Processes, provenance and products of the CareTrack Kids study. PLOS One. 2019;14(1):e0209637.
23. Wiles LK, Hooper TD, Hibbert PD, et al. CareTrack Kids—part 1. Assessing the appropriateness of healthcare delivered to Australian children: study protocol for clinical indicator development. BMJ Open. 2015;5(4):e007748.
24. Mangione-Smith R, DeCristofaro AH, Setodji CM, et al. The Quality of Ambulatory Care Delivered to Children in the United States. NEJM. 2007;357(15):1515-23.
25. McGlynn EA, Asch SM, Adams J, et al. The Quality of Health Care Delivered to Adults in the United States. NEJM. 2003;348(26):2635-45.

26. Hibbert PD, Wiles LK, Cameron ID, et al. CareTrack Aged: the appropriateness of care delivered to Australians living in residential aged care facilities: a study protocol. BMJ Open. 2019;9(6):e030988.
27. Brouwers M, Kho ME, Browman GP, Cluzeau F, Feder G, Fervers B, Hanna S, Makarski J, AGREE obot, Next Steps Consortium. AGREE II: Advancing guideline development, reporting and evaluation in healthcare. Can Med Assoc J. 2010;182(E839-842).
28. National Health and Medical Research Council. NHMRC Guidelines for guidelines: Identifying and managing conflicts of interest. Canberra, Australia: NHMRC; 2018.
29. Brook R, Chassin M, Fink A, et al. A method for the detailed assessment of the appropriateness of medical technologies. Int J Technol Assess Health Care. 1986;2(1):53-63.
30. Fitch K, Bernstein SJ, Aguilar MD, Burnand B, LaCalle JR, Lázaro P, van het Loo M, McDonnell J, Vader JP, Kahan JP. The RAND/UCLA Appropriateness Method: User's Manual. Santa Monica, USA: RAND Corporation; 2001.
31. Stroke Foundation. Living stroke guidelines 2021 [Accessed: 20th October, 2021]. Available from: https://strokefoundation.org.au/What-wedo/For%20health%20professionals%20and%20researchers/Living%20stroke%20guidelines].
32. Flemming K, Booth A, Garside R, et al. Qualitative evidence synthesis for complex interventions and guideline development: clarification of the purpose, designs and relevant methods. BMJ Glob Health. 2019;4(Suppl 1):e000882.
33. Rehfuess E, Stratil J, Scheel I, et al. The WHO-INTEGRATE evidence to decision framework version 1.0: integrating WHO norms and values and a complexity perspective. BMJ Glob Health. 2019;4(Suppl 1):e000844.

Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

Tables

Table 1 Professional demographic information for reviewers. Created by the authors.

	N	%
Professional group*		
Nursing	11	23
Research	8	17
Medicine	7	15
Speech pathology	4	9
Optometry	4	9
Dietetics	2	4
Physiotherapy	2	4
Dental	2	4
Pharmacy	2	4
Psychology	2	4
Audiology	1	2
Other	2	4
Current primary employer*		
University	23	53
Aged Care Health/Service Provider	8	19
Public health Service	7	16
Allied health service provider	3	7
Other	2	5

* Experts may be counted more than once if they elected multiple professional groups or primary employers

Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

Table 2 Final derived indicators – numbers and examples. Created by the authors.

Condition	No. of CPGs	No. of indicators	Examples of indicators
Admission	42^*	30	Residents on admission should have a medical history taken.
			Residents on admission should receive a skin wound risk assessment.
Bladder and bowel	15*	21	Residents who newly present with symptoms of urinary incontinence should have a focused physical examination.
			Residents who have been identified at risk of constipation, should receive prevention interventions.
Cognitive impairment	13*	22	Residents who have symptoms of delirium or dementia, should receive: - a cognitive assessment using a standardised tool AND

Condition	No. of CPGs	No. of indicators	Examples of indicators
			- medication review AND - physical examination
			Residents who have dementia without psychosis should not be prescribed anti-psychotics as a first-line approach.
Depression	6*	11	Residents who have depression should have a comprehensive multidisciplinary care plan.
			Residents prescribed antidepressants should be monitored for side effects monthly.
Dysphagia and aspiration	3	7	Residents who have a choking incident should receive or have a review of a choking/dysphagia care plan
			Residents who have acute dysphagia should receive immediate evaluation and intervention (within 6 hours.)
End of life Care	17*	23	Residents should have a clinical care plan relating to end of life.
			Residents who are dying should be prescribed anticipatory medicines with indications for use, and a range of doses and routes of administration.
Hearing and vision	5	5	Residents who present for the first time with hearing difficulties should: - have an otoscopic examination to exclude impacted wax and acute infection - be referred for audiological assessment
			Residents who have any new vision loss or sudden change in vision should be referred for an assessment by an eye care specialist within one week.

Condition	No. of CPGs	No. of indicators	Examples of indicators
Infection	14*	16	Residents who have symptoms of a urinary tract infection should have a urine sample taken (to test for signs of infection or other abnormality) within 24 hours.
			Residents who have suspected influenza should have a nose and/or throat swab for laboratory testing.
Medication	20*	7	Residents should have a medication review when they: - have worsening health OR - have signs of administration problems OR - are on multiple psychotropic drugs OR - when a new medicine is ordered.
			Residents who are newly prescribed a medication should receive a monitoring plan.
Mobility and falls	12*	15	Residents at medium/high risk of falling should receive a multifactorial intervention.
			Residents post-fall should have details of the fall taken
Nutrition and hydration	9	20	Residents should receive monthly screening for malnutrition using a validated tool.
			Residents who have unplanned weight loss or are at risk of weight loss, should receive referral to: - a GP AND - a dietitian
Oral and dental care	7	9	Residents should have a current oral health care plan.
			Residents who have unexpected findings during oral care should be referred to their GP or dental professional.

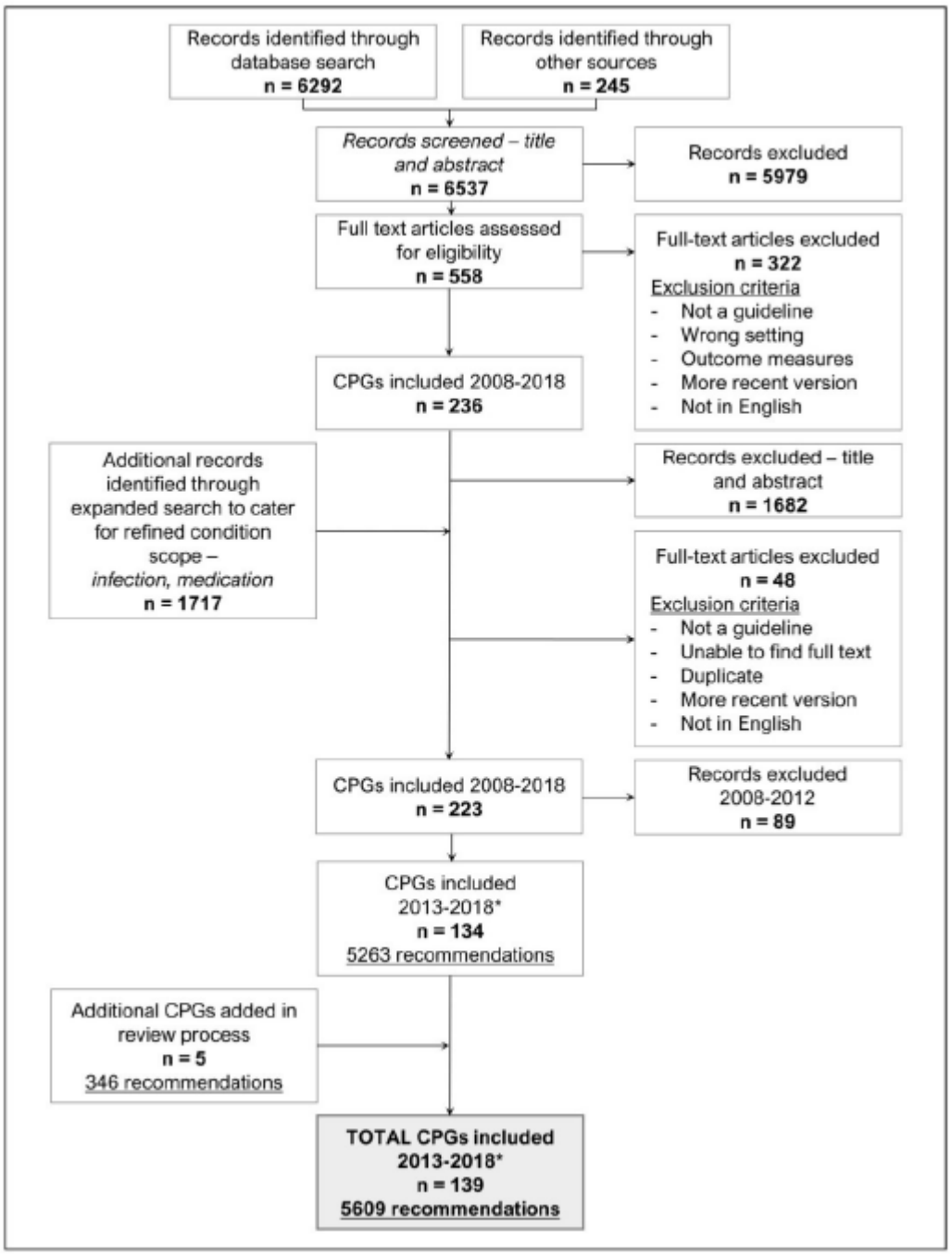
Condition	No. of CPGs	No. of indicators	Examples of indicators
Pain	8*	25	Residents for whom pain is suspected should receive a pain assessment using: - self-report AND/OR - observational (e.g., non-verbal, or behavioural)
			Residents who have pain should have the effectiveness of their current treatments for pain evaluated.
Restraint	2	2	Residents who are being physically restrained had a multidimensional assessment prior to restraint use
			Residents who are being physically restrained should have daily evaluation of behaviour and behaviour interventions.
Skin integrity	13*	17	Residents should receive a skin wound risk assessment: - whenever the resident's condition significantly changes; and - monthly
			Residents who have a pressure injury should be repositioned at least every 4 hours.
Sleep	3	6	Residents newly diagnosed with insomnia should have their medications reviewed within one week.
			Residents who have newly diagnosed insomnia should receive non-pharmacological interventions as a first line treatment.
Total	N/A#	236	

^ Admission was created using indicators from other conditions – therefore all the Admission CPGs are also counted under other conditions; * Count includes Royal Australian College of General Practitioners' Silverbook 2019 which was used for multiple conditions; CPGs – clinical practice guidelines; # Total CPGs is not applicable as some guidelines were used for multiple conditions.

Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

Figure Legends

Figure 1: Clinical practice guidelines search and inclusion (Stage 1). Created by the authors.
** Includes infection CPGs from prior to 2013, and the Royal Australian College of General Practitioners' Silverbook publication from 2019.*



Hibbert, P.D., Molloy, C., Wiles, L.K., Cameron, I.D., Gray, L.C., Reed, R.L., Kitson, A., Georgiou, A., Gordon, S.J., Westbrook, J., Arnolda, G., Mitchell, R.J., Rapport, F., Estabrooks, C., Alexander, G.L., Vincent, C., Edwards, A., Carson-Stevens, A., Wagner, C., McCormack, B., Braithwaite, J. Designing clinical Indicators for common residential aged care conditions and processes of care: the CareTrack Aged development and validation study. International Journal for Quality in Health Care: 2022

Figure 2: Number of indicators by Delphi round. Created by the authors.