



Indicators for
Quality Use of Medicines
in Australian Hospitals

Interim Report

for the
**Australian Commission on
Safety and Quality in Health Care**
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Promoting the quality use of medicines

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An initiative of NSW clinical pharmacologists & pharmacists. Funded by the NSW Department of Health.

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Preamble

About New South Wales Therapeutic Advisory Group Inc (NSW TAG)

The NSW TAG is an independent, not-for-profit association representing Drug & Therapeutics Committees (DTCs) in NSW hospitals. Its members include clinical pharmacologists, pharmacists, nurses and other clinicians from NSW hospitals and affiliated academic units. NSW TAG was formally incorporated as a non-profit association in 1994. It receives funding from the NSW Ministry of Health.

The goal of NSW TAG is to achieve quality use of medicines in NSW, through involvement of all stakeholders. In pursuing this goal NSW TAG focuses on providing information, advice and support to decision-makers in NSW public hospitals, the NSW Department of Health and other relevant organisations.

The objectives of NSW TAG are:

- To investigate and evaluate new initiatives in therapeutics
- To support Drug and Therapeutics Committees
- To promote rational, high quality, safe and cost-effective use of medicines in public hospitals and the wider community.

For more information, visit NSW TAG online at www.nswtag.org.au .

About the Clinical Excellence Commission (CEC)

The core mission of the CEC is to identify issues of a systemic nature that affect patient safety and clinical quality in the NSW health system and to develop and advise on implementation strategies to address these issues. Part of the role of the CEC is to acquire and share information about how well the NSW health system is performing and to use this information to improve the performance of the system.

The formation of the CEC comes at a time when we are developing a new way of looking at, and an understanding of, health care. Although the standard of healthcare available to the public is now better than it has ever been, health professionals and their agencies have a greater appreciation of where things can go wrong and acknowledge the role the entire system can play in this.

Today, analysis of quality and safety in health care looks directly at the nature of human and system error. There is also a change in culture from that of individuals working on their craft to teams of professionals working together.

In addition to addressing safety and quality issues the CEC is charged with identifying, developing and sharing information about safe practices in health care.

This includes developing, providing and promoting training and education programs as well as identifying priorities for, and promoting research into, better health care practices.

The CEC reports annually to the NSW Minister for Health with a focus on:

- Promoting and supporting improvement in clinical quality and patient safety;
- Consulting broadly with health professionals and members of the community;
- Identifying and sharing information about safe health care practices across the State via training and education programs; and
- Monitoring clinical quality and safety processes in Area Health Services.

The CEC has been established as a statutory health corporation under the Health Services Act 1997.

For more information, visit CEC online at www.cec.health.nsw.gov.au.

Introduction

The measurement of quality use of medicines (QUM) indicators enables identification of gaps in practice in the judicious selection of treatment options and the appropriate, safe and effective use of medicines. QUM is an important component of Australia's *National Medicines Policy*. QUM indicators are designed to facilitate QUM improvement strategies and can be used to assess the effectiveness of such strategies or, when used periodically, can monitor hospital performance with regard to medicines management over time. As such they have potential as accreditation criteria or key performance indicators for jurisdictions.

In 2007, the New South Wales Therapeutic Advisory Group (NSW TAG) in collaboration with the Clinical Excellence Commission (CEC) developed *Indicators for Quality Use of Medicines in Australian Hospitals (QUM Indicators 2007)*.¹ The indicators are process indicators which measure compliance with processes of care related to medicines management that have been shown to improve health outcomes. The indicators aimed to measure six aspects of care using QUM assessment. The aspects of care were:

- Antithrombotic therapy
- Antibiotic therapy
- Medication ordering
- Pain management
- Continuity of care, and
- Hospital-wide medication management policies.

These themes were identified as representing high-risk or high-use medicines, high-risk populations and high-risk clinical settings. The indicators were validated and pilot-tested in clinical environments prior to publication. Efforts in the development of the *QUM Indicators* sought to ensure that clinicians would accept the indicators as valid, feasible, useful and important for measurement of QUM practices and so enhance routine use in busy clinical settings.¹ Importantly these indicators were developed to be clinician-led, because knowledge and ownership at this level was acknowledged as most likely to generate successful practice change processes when these were required. Moreover clinicians were recognised as having the expertise and resources to promote the use of the indicators and lead improvements strategies.¹ Clinician-directed audit and feedback is recognised as one of the most effective strategies for improving quality and safety of health care.

The Australian Commission on Safety and Quality in Health Care's 2009 *National Medication Safety and Quality Scoping Study Report* made the following recommendations:

- Recommendation 27: Inform development of safe medication practice indicators for all settings of care;
- Recommendation 41: Set national agreed priorities for addressing gaps in practice in quality use of medicines and safe medication practice and monitor outcomes through the use of indicators; and
- Recommendation 42: Develop safe medication practice indicators.

An important element of the Commission's strategy for improving the quality of health care is making available current QUM indicators for use by Australian hospitals. The Commission has an interest in updating the *QUM Indicators 2007* to ensure they are current.

In addition, the Commission has an interest in ensuring that hospitals are able to input *QUM Indicators 2007* data into a secure data base which can report back to hospitals on outcomes, on outcomes over time and on outcomes compared to (de-identified) peer and all hospitals data nationally.

Aims

NSW Therapeutic Advisory Group was funded by the Australian Commission on Safety and Quality in Health Care in 2011 to review the *QUM Indicators 2007*. The review had two objectives:

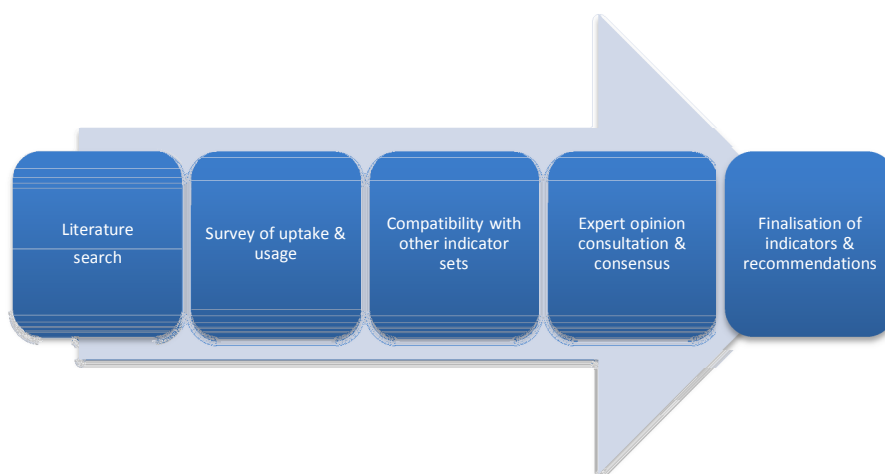
- Review and revise the *Indicators for Quality Use of Medicines in Australian Hospitals 2007*, and
- Scope a web-based reporting system for the *QUM Indicators 2007* and which could be used by Australian hospitals to enter and store data and obtain reports including benchmarking against other participating hospitals.

Methods

QUM Indicators 2007 review and revision

Review and revision of the *QUM Indicators 2007* was undertaken in five phases and is shown in Figure 1. The *QUM Indicators 2007* and descriptors are attached to this report. The perspective adopted for the revision was that gaps in best practice regarding the quality use of medicines in Australian hospitals remained and the use of indicators represented an opportunity to drive improvements in practice at the local level.

Figure 1: Methods used for review and revision of *QUM Indicators 2007*



1. Literature review and search

A literature review was required as the basis for assessing the currency of the indicators and supporting evidence. It was noted that there had been innovations and changes in national guidelines and other recommendations regarding venous thromboembolism prophylaxis and aminoglycoside monitoring.

An initial analysis of the indicators was undertaken to identify key practice changes since publication of the *QUM Indicators 2007*. This included a search for new national guidelines, publications and recommendations since 2007. A search of the literature regarding who may have used the *QUM Indicators 2007* and articles describing the development or use of quality clinical indicators that cited the *QUM Indicators 2007* was also undertaken using Web of Science, Google Scholar and Google databases.

2. Survey of Australian hospitals and health services regarding uptake and utilisation of QUM Indicators

Pharmacy departments and drug and therapeutic committees of Australian hospitals and health services were identified (using the NSW TAG contact list) and invited to participate in a survey designed to report on uptake and use of the *QUM Indicators 2007*. The *Report of 2011 Survey: QUM Indicator Uptake and Utilisation* (User Survey) is attached to this report.

3. Compatibility of indicators in current national and state-based performance assessment tools

The compatibility of *QUM Indicators 2007* with national and state-based performance measures relating to quality use of medicines was assessed. The results of this appraisal are found in Table 4 of the User Survey.

4. Expert opinion consultation

Key expert groups and individual clinicians were consulted on potential changes to the indicators either by 'phone, face-to-face meetings or email. Whenever possible, experts representing specialist national bodies and clinical specialists in areas of relevant expertise were consulted. Draft amendments to the indicators were prepared and new draft documents prepared when major changes were proposed. The information, and information from a number of other sources, was considered by a meeting of the QUM Indicators Review Committee which consisted of NSW TAG editorial committee members as well as some individuals involved in development of *QUM Indicators 2007*. Membership of this Review Committee is provided in the Acknowledgments section on page 5 of this report.

The committee met in February 2012 and considered:

- expert opinion from specialist national bodies and clinical specialists (responses are shown in Correspondence, Appendix 1)
- results and comments from the User Survey, and
- updated references found during the literature search which included new editions of the relevant practice guidelines.

5. Summation of review

Data collected during the review were collated and analysed in this report and recommendations made for substantial modification of some indicators, development of new indicators and review of other indicators in the near to medium future.

Scoping study for the development of a web-based reporting system

The Australian Commission on Safety and Quality in Health Care proposed that an electronic application for locally monitoring *QUM Indicator 2007* results over time be made available for hospitals. Ideally the application would use principles of statistical process control that enabled and encouraged clinicians to drive local quality improvement initiatives. The application would link with a database enabling state-wide and national monitoring. The application would also enable immediate feedback of results directly to the clinicians entering the data.

The purpose of the scoping study for developing a web-based reporting system was to scope a system for the *QUM Indicators 2007*, considering existing systems used for reporting of audit data.

A proposal for designing and implementing a centralised web-based reporting system for the *QUM Indicators 2007* was formulated. It was informed by a literature search and consultation with clinical experts. NSW TAG was not expected to build a system but advise on the necessary system capabilities from a user perspective. The web-based reporting system could be used by hospitals (at various levels including wards, units, specialties and institution) and jurisdictions to enter data manually or upload data from electronic clinical records, report QUM indicator results and compare with previous results and peers. The proposed model should be a sustainable resource which allows for immediate results and clear presentation of data in a statistically valid form. The *Indicators for Quality Use of Medicines in Australian Hospitals: Scoping Study for Development of a Web-based Reporting System* (Scoping Study) is appended to this report.

Results

QUM Indicators 2007 review and revision

1. Literature review

Review to ensure the currency of the indicators and their supporting evidence: A review of the literature identified the most recent evidence within the indicator domains. Reference literature used in the indicators, such as the *Australian Medicines Handbook*, was updated. Relevant practice guidelines and recommendations, such as the *National Health and Medical Research Council Guidelines for Venous Thromboembolism Prophylaxis in Hospitalised Patients 2009ⁱⁱ* and the *Therapeutic Guidelines (Antibiotic) 2010ⁱⁱⁱ*, and both representing significant practice changes since publication of the *QUM Indicators 2007*, have also been included. The recent marketing of new oral anticoagulant drugs in Australia also suggested possible amendments to the existing warfarin indicators. The content of each indicator was reviewed and revised based on the findings of the literature review and in relation to current national guidelines and recommendations. Original references were checked to ensure relevance to current best

practice and which, in most cases, remained relevant and were therefore retained. New references were identified and Appendix A displays indicators updated or altered reference sections.

Information provided in the 'Background', 'Developing the Indicators for Quality Use of Medicines in Australian Hospitals' and 'Using the Indicators for Quality Use of Medicines in Australian Hospitals' sections of the original 2007 publicationⁱ was still applicable and the references to those sections remained appropriate.

The literature review was also used to inform the specialist consultation process.

Search for published studies that had cited the *QUM Indicators 2007*: A literature search was undertaken to investigate whether the *QUM Indicators 2007* had been used in any published studies. This proved difficult as publication of the *QUM Indicators 2007* was classified as grey literature and therefore not cited in traditional citation search databases such as the Web of Science. Two categories of literature were identified: those that described projects that had used QUM indicators and those that had analysed the literature regarding the use of quality improvement indicators.

There were three published studies conducted in Australian hospitals that had used the *QUM Indicators 2007*.^{iv,v,vi} They focused on two aspects of care: antithrombotic therapy and antibiotic therapy. The studies were led by academic pharmacists. More than one indicator had been used in these studies.

Other published articles discussed use of the *QUM Indicators 2007* in the development of new indicator sets, either for particular countries such as Canada^{vii} and Germany^{viii}, or for particular drugs or patient groups such as cancer chemotherapy^{ix}, older hospitalised patients^x or patients in intensive care units^{xi}. Other articles discussed the scientific rigour required for the development of quality indicators^{ii,xii,xiii} or the value of using indicators to optimise medication use^{xiv,xv,xvi,xvii} or reviewed or catalogued quality indicators.^{xviii,xix}

2. Survey of QUM uptake and utilisation

A survey of Australian hospitals was undertaken to establish current use of the *QUM Indicators 2007*.

The survey aimed to identify:

- Which indicators are currently used in Australian hospitals
- How and why specific indicators are used
- Reasons why specific indicators may not be used, and
- Amendments made to indicators by hospitals and jurisdictions to facilitate use.

The survey was undertaken in late 2011 and pharmacy departments or drug and therapeutics committees were invited to respond. A 23% (38/163) response rate is estimated, which is consistent with response rates for surveys conducted via email. It is probable that invitations were sent to hospitals lacking the staff or resources to undertake projects using the *QUM Indicators 2007* and this resulted in a lower response rate. The full survey report is attached. A summary of the survey phase of the project is shown in Table 1. The results and the comments received from survey respondents were used to inform the expert opinion consultation.

Table 1: Synopsis of QUM Indicator 2007 User Survey results

QUM Indicator No.	Commonly used	Most commonly amended	Most commonly not used	Most commonly used in other indicator sets
1.1	Commonly used	Most commonly amended		
1.2	Commonly used			
1.3				
1.4				
1.5		Most commonly amended		
1.6			Most commonly not used	
2.1				
2.2	Commonly used			
2.3		Most commonly amended		
2.4				
2.5				
3.1	Commonly used	Most commonly amended		Most commonly used in other indicator sets
3.2	Commonly used			Most commonly used in other indicator sets
3.3	Commonly used			
3.4				
3.5				
3.6			Most commonly not used	
4.1				
4.2				
5.1				
5.2			Most commonly not used	
5.3	Commonly used			Most commonly used in other indicator sets
5.4	Commonly used			

5.5				
5.6				
5.7				
6.1				
6.2				
6.3				
6.4				

3. Compatibility

QUM indicator compatibility with other national and state-based indicator sets or standards documents is displayed in Table 4 of the User Survey. Table 1 above displays QUM indicators commonly used in a number of the indicator sets or standards documents (Indicators 3.1, 3.2, 5.3 and 6.2).

4. Expert opinion consultation and consensus

The QUM Indicators Review Committee (the review committee) met in mid-February 2012. All considerations were recorded in a spreadsheet with summary of the issues and consultation and which forms Appendix 2 of this report. Of note were deliberations regarding frequently amended QUM indicators (shown in Table 1) as this was regarded as evidence that the indicators may require modification. Outcomes from the review committee’s deliberations were as follows:

- *Indicator 1.1* - no modification was recommended apart from updating text and references to ensure alignment with current recommendations and tools
- *Indicator 2.3* - amendments were noted and further modification in line with best practice recommendations and further consultation recommended, and
- *Indicators 1.5 and 5.3* – it was noted that these were usually altered to comply with jurisdictional requirements and no modification was recommended.

Correspondence and consultation continued to be received regarding the indicators review since the consultation meeting and these have resulted in further refinement (to Indicators 2.3, 5.2 and 6.4). The correspondence forms Appendix 1 of this report.

5. Interim recommendations

The draft *QUM Indicator 2012* set is provided with this report. A summary of the revised QUM indicators is shown in Table 2 including changes that have been made to each indicator and subsequent recommendations about future use and review.

Table 2: Summary of changes and recommendations for QUM Indicators 2007 update

Revision	Indicators	Recommendations
Unchanged indicators	6.1, 6.3	Review in 5 years
Indicators with updated references only	1.4, 1.5, 2.1, 3.3. 3.4, 4.1, 4.2, 5.5, 5.6, 6.2	Review in 5 years EXCEPT: - Review within 2-3 years for 1.4 and 1.5 to assess continued relevance.
Indicators with some change in body of text to reflect new guidelines/ recommendations but essentially the same with updated referencing	1.1 updated 1.3 significant renal function defined 1.6 CHADS-VASc, HAS-BLED tables 2.2 antibiotic list updated & antimicrobial stewardship included 2.4 updated severity scores 2.5 updated severity scores 3.1 aligned with ACQSHC Match UP Medicine brochure 3.2 updated results in text 3.5 updated list of intermittent therapies 3.6 updated sources of cancer protocols 5.3 added further example of medication therapy changes & added medication reconciliation forms) 5.4 updated text 5.7 list of sedatives omitted, discharge or transfer	Review in 5 years EXCEPT: - Review within 2-3 years for 1.3 with respect to exclusion of renal impairment. - Review within 2-3 years for 1.6 and 5.4 with respect to advent of new oral anticoagulants.
Modified indicators to reflect current recommendations and/or innovations & updated referencing	1.2 5.1 5.2	For wider consultation & field testing
New indicators	2.3a, 2.3b	For wider consultation & field testing

Discussion

There was considerable comment received from survey respondents wanting the indicators maintained even if specific indicators had not been used to date.

Several of the most used indicators are replicated in similar format in other data collections, both nationally and jurisdictionally, suggesting that benefit may arise from having a uniform national set of indicators. As illustrated in Table 2, the indicators most commonly used in national and state-based indicator sets (Indicators 3.1, 3.2, 5.3 and 6.2) were essentially unchanged and indicator descriptions will not require updating in these other datasets as a result of this review.

The User Survey indicated that measurement of QUM indicators targeting the discharge process is difficult. Further thought is required to enhance measurement of these indicators and this could be a focus for the Commission given the recent Australian National Safety and Quality Goals in Health Care discussion document^{xx}. It is apparent that electronic medication management systems may improve access to information required for the collection of the discharge indicators.

The survey found that there is opportunity for collaborative data collection and review that users should be encouraged to explore. As noted in the literature, the measurement of quality indicators and the implementation of improvement programs, unless mandated, is reliant on the enthusiasm of often resource- and time-poor local clinicians. Many of the barriers to the use of indicators may be resolved with the implementation of electronic medication management systems. In addition, a centralised web-based reporting system that provides meaningful feedback to clinicians may provide an additional driver to use of QUM indicators.

It was unclear whether users of the indicators were using recommended concurrent indicators (Indicators 1.1 and 1.2; 2.4 and 2.5; 4.1 and 4.2; 3.1, 5.3 and 5.7). These indicators often provide complementary information and they may sometimes use the same resources and sample populations, so concurrent measurement should be encouraged and widely communicated to potential users.

Literature search

The number of publications, which used the *QUM Indicators 2007* as measures of QUM in hospitals, was low. The small numbers of studies undertaken using the *QUM Indicators 2007* may be a result of publication lag time and the relatively recent release of the *QUM Indicators 2007*. In addition, publication is more likely to occur when academics are involved and less so when local clinicians are undertaking quality improvement. Publication of studies and other uses of QUM indicators should be encouraged. Many projects using the *QUM Indicators 2007* (with or without subsequent drug use evaluation studies) have been undertaken in single institutions using a quality assurance paradigm but which have not obtained clearance from ethics committees, a common requirement for publication.

The literature search revealed that a number of countries or clinical settings are developing medication safety and quality indicators. In particular, the Institute for Safe Medication Practices Canada recently published 12 candidate medication safety indicators.^{viii} There are three types of four indicators representing structure, process and outcomes. The four Canadian process indicators are aligned with the 2012 *QUM Indicators 5.1, 3.1, 2.1 and 1.2*. One of the Canadian structure indicators is aligned with *QUM Indicator 6.1*. Further review of these indicators may be useful for the Australian setting.

Update of 2007 QUM Indicator publication and release of 2012 QUM Indicator set

Publication of the new *QUM Indicators 2012* on the Commission and NSW TAG websites is planned when wider consultation and field testing have been undertaken and the indicators set finalised. The beginning sections of the *QUM Indicators 2007* do not require modification. The 'Developing the Indicators for Quality Use of Medicines in Australian Hospitals' section in the 2007 publication describes the development of the original indicators. As many of these indicators remain essentially the same in the reviewed document, the described process remains accurate. However the reviewed indicators will need to undergo some of the steps advocated in the 'Developing the Indicators for Quality use of Medicines in Australian Hospitals' section in the original publication, particularly field testing, prior to availability. It should also be noted that since the field testing at various hospitals was undertaken in 2006-2007, ethical and governance requirements have changed in Australia and field testing of the new indicators will require ethics approval. Due to the time constraints of the project at this stage, it was difficult to obtain the optimal balance in expertise required for review of the new QUM indicators (Table 2). It is acknowledged that there was a predominance of pharmacists in the review committee and this is one of the reasons that wider consultation for new or modified indicators is recommended.

The section describing indicator use in hospitals in the 2007 publication is still applicable and the 'Feedback' section is particularly useful if a web-based reporting system with statistical rigour is developed.

The indicators have potential as accreditation criteria or key performance indicators for jurisdictions and some have been adapted for this use. Public and comparative reporting of hospital indicator outcomes is, perhaps naturally, raising concerns,^{xxi} although Australia lags behind other countries in this regard.^{xxii,xxiii} These concerns may magnify as we move closer to electronic systems allowing easier comparative and public reporting. The caveat related to 'Inter-hospital comparisons' using the indicators found in the 2007 publication also applies to the revised 2012 indicator set. Lessons learned from a multi-site project in relation to *Indicator 5.3* undertaken since the 2007 publication, as well as development of databases for drug utilisation evaluation projects for antimicrobial stewardship, can inform benchmarking processes. Moreover some indicators (see User Survey, Table 4) may have already been used for benchmarking. For the remaining indicators, it remains that the indicators "are considered potentially useful for inter-hospital comparisons. However, for most indicators, ongoing validation is recommended, to ensure that they are sensitive and reliable enough to measure variation in practice between hospitals over time and to provide a robust measure for meaningful inter-hospital comparison."ⁱ

Prior to the *QUM Indicators 2012* becoming available on the internet, hyperlinks to other projects or websites cited in the Further Information and References sections of each indicator will require activating. For example, in *QUM Indicator 1.1*, links to websites of the National Health and Medical Research Council, Australian Commission on Safety and Quality in Health Care and Clinical Excellence Commission will be useful for those considering a study involving

Review of 2012 QUM Indicators & future modification of QUM Indicators

Review of the majority of QUM indicators is recommended in 2016/7. However there are some indicators which will require review sooner. In particular, the indicators focusing on warfarin are likely to require modification or possibly removal in the next few years. Indeed, depending on the timing of the release of the *QUM Indicators 2012*, it is possible that these indicators may require modification prior to release. This will depend on the availability and uptake of the newer oral anticoagulants as well as government reviews of anticoagulant use. It is also possible that if indicator measurement indicates widespread compliance, which may be realised sooner with the use of a web-based reporting system, some indicators may be deleted from the set in the future as has occurred in other countries.^{xxiv,xxv} The relevance or redundancy of indicators needs reviewing and updating regularly as the evidence-base for an indicator changes or is fully adopted.^{viii,xvii}

A watching brief of the literature and results from indicator measurement will help identify when the QUM indicators may require modification. In this way, modification of individual indicators may not be so onerous in the future. For example, analysis of anticoagulation therapy in hospitalised patients in 2009 demonstrated that gaps between actual practice and guideline-recommended therapy remain.^{xxvi} Hence the continued use of indicators was recommended. However, while certain aspects in anticoagulant therapy appeared to be improving, the study by Tiryaki et al showed that the results were due to gaps in certain procedures and certain patient groups, such as renal impairment and obesity. It is important to note that currently *QUM Indicator 1.3* excludes significant renal impairment and does not identify specific groups. Clinicians require education that if practice gaps remain in the broad population, they are likely to be larger in more vulnerable populations. Future consideration of indicator modification such as measurement in specific groups or for certain procedures may be more useful to identify QUM gaps although it is acknowledged that continued monitoring is often required to maintain change.

Development of other QUM indicators

Some comments on development of other indicators arising from this project are provided:

- QUM indicators are required to support the work of drug and therapeutics committees (DTCs) in local hospital networks (and districts).
- Gaps in other areas of practice relating to QUM remain. In the development of the *QUM Indicators 2007*, fifty-two indicators were identified and tested. Twenty-two indicators were excluded from the final set for a variety of reasons including measurability issues, lack of consensus regarding the evidence base, lack of a gap in practice in hospitals that tested the indicators, that indicators lacked face validity and that indicators were already being collected nationally. The need for some of these indicators could be revisited. While gaps in practice as outlined by the National Institute of Clinical Studies^{xxvii}, such as atrial fibrillation and stroke, heart failure therapy and venous thromboembolism prophylaxis are targeted by the current indicator set, other gaps in practice could be targeted such as mental health. NPS Better Choices

Better Health's *Discharge Management of Acute Coronary Syndrome Project* identified continuing gaps in the treatment of acute coronary syndromes (ACS), notably smoking cessation and cardiac rehabilitation referral.^{xxviii} Some of these practice areas are also the focus of the Commission's safety and quality goals such as diabetes, ACS and continuity of care.^{xxii} Furthermore, and anecdotally, concern has been raised regarding the appropriate, safe and effective use of vancomycin and, given its widespread use, consideration for an indicator regarding its use may be worthwhile.

Conclusions

The *QUM Indicators 2007* have been reviewed and revised where necessary or recommendations for further work made. The majority of indicators are essentially unchanged although with updated references.

However five indicators will require further work to ensure that the modifications meet the requirements necessary for an effective quality indicator as outlined in "The development process" section of the *QUM Indicators 2007*.

At this stage, it is recommended that the indicator set be expanded to 31 indicators with 2007 indicator 2.3 being split into two indicators reflecting different aspects of the current Australian aminoglycoside use guidelines.

A schedule for review of the QUM indicators is included in the recommendations.

Development of QUM indicators for other therapeutic domains remains an attractive option for both local health services and for national policy organisations.

Acknowledgments

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The Review Committee provided input during the consultation process. Their assistance is very much appreciated.

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Consultations

A number of individuals and organisations have been involved in an ongoing process of consultation. Their cooperation and advice has been integral to this project. We thank them all for their advice and input. Key organisations and individuals who assisted us are listed in Appendix 2 of the Interim Project Report and Page 29 of the Final report of the 2011 Survey: QUM Indicator Uptake and Utilisation Report.

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