

## Title page

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Systematic review of Morbidity and Mortality meeting standardisation: does it lead to improved professional development, system improvements, clinician engagement and enhanced patient safety culture?

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Morbidity, mortality, patient safety, standardisation, professional development, quality improvement, clinician engagement, organisational culture, systems analysis, education

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## Abstract

**Objectives:** This systematic review sought to better understand the effect of standardised Morbidity and Mortality meetings (M&Ms) on learning, system improvement, clinician engagement, and patient safety culture.

**Methods:** Three electronic databases were searched using a range of text words, synonyms, and subject headings to identify the major concepts of M&M meetings. Articles published between October 2012 (the end date of an earlier review) and February 2021 were assessed against the inclusion criteria, and thematic synthesis was conducted on the included studies.

**Results:** Following abstract and full text review in Covidence, from 824 studies identified, 16 met eligibility criteria. Studies were mostly surveys (n=13) and evaluated effectiveness primarily from the perspectives of M&M chairs and participants, rather than assessment of objective improvement in patient outcomes. The most prevalent themes relating to the standardisation of M&M processes were case selection (n=15) and administration (n=12). The objectives of quality improvement and education were equally prevalent (12 studies each), but several studies reported these two objectives as conflicting rather than complementary. Clinician engagement, patient safety culture, and organisational governance and leadership were identified as facilitators of effective M&Ms.

**Conclusion:** There is insufficient evidence to guide best practice in M&Ms, but standardised structures and processes implemented with organisational leadership and administrative support are associated with M&Ms that address objectives related to learning and system improvement. Standardisation of the structures and processes of M&Ms is perceived differently depending on participants' role and discipline, and clinician engagement is critical to support a culture of safety and quality improvement.

## Introduction

Morbidity and Mortality meetings (M&Ms) are held to analyse clinical complications or adverse events and to reflect on patient outcomes in health service organisations with the objective of improving healthcare. M&Ms are also considered important in the continuing education of clinical staff, as an opportunity to review and improve performance and engage in organisational quality improvement efforts <sup>1</sup>.

Originating in the early 20<sup>th</sup> century, M&Ms were introduced to support the training of surgeons in the USA, before extending to other specialties and countries. With the focus of healthcare quality shifting from individual to system performance<sup>2</sup>, quality improvement efforts have evolved from cause-effect analysis of a change in clinical practice to consider complex systems and organisational factors when implementing any change. M&Ms have been adopted by safety and quality initiatives in some jurisdictions, and tied to accreditation of hospitals and health services in some cases, but the organisation of M&Ms has often not changed to align with contemporary clinical governance frameworks that establish communication and information sharing pathways connecting consumers and clinical teams to executives and boards <sup>3,4</sup>.

Researchers have proposed that more formal or standardised structures and processes could improve the effectiveness of M&Ms <sup>5,6</sup>. Studies on the effectiveness of M&Ms in patient safety have mostly relied on proxies such as clinician attitudes and rates of clinical incidents. Some controlled studies have demonstrated decreases in morbidity and mortality but limitations in research methodology mean that evidence-based recommendations for best practice M&Ms are lacking<sup>7</sup>.

A systematic review published in 2016 <sup>7</sup> focused on the goals, structures, and processes of M&Ms. It observed a lack of standardisation in the goals, processes and structures of M&Ms, and limited descriptions of characteristics considered important for effective M&Ms. The authors recommended that M&Ms aim to provide both quality improvement and education, and follow a consistent structure of: regular (weekly or monthly) meetings; a set number of cases presented; participation by multidisciplinary clinicians, and; an independent moderator.

In 2020, internal assessment by a large Australian health service organisation with more than 14,000 staff across five hospitals and a number of health centres identified that it had no published procedure for M&Ms and that there was wide variation in membership and conduct of meetings across the organisation. Information gained about current practices found informal structures and processes were in place for supporting staff to investigate, analyse, identify and improve clinical outcomes via M&Ms. A preliminary literature review was undertaken to inform the development of a local quality improvement project to work towards a standardised best practice approach to M&Ms that could be implemented across the organisation. The aim of this paper is to present the results of a systematic review of literature on M&Ms systems and processes and their relationship to learning, system improvement, clinician engagement and patient safety culture.

## Methods

The systematic review collected and analysed published data and evidence to answer the following PICO (patient, intervention, comparison, outcome) formatted research question:

- Does a standardised M&M structure and process support learning and system improvement and improve clinician engagement and patient safety culture?

The search was done in February 2021 and limited to literature published between October 2012 and February 2021, based on the end date of an earlier systematic review of M&Ms<sup>7</sup>. The literature review was structured using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses—PRISMA statement <sup>8</sup>. The search strategy and inclusion and exclusion criteria were published on the Open Science Framework platform (DOI 10.17605/OSF.IO/EFVMX). A record of research team meetings was maintained as part of the audit trail.

## Inclusion and exclusion criteria

Empirical or theoretical studies discussing M&Ms in English focusing on adult populations and hospital settings were included. Publications that were reviews or opinion pieces were excluded along with abstracts or conference presentation summaries. Studies measuring and reporting clinical rather than process outcomes were excluded as these were not relevant to the purpose of this review.

## Electronic databases

A range of text words, synonyms, and subject headings were developed for M&Ms (see online appendix). These text words, synonyms, and subject headings were used to search three electronic databases that index journals of relevance to the review topic (Pubmed, Embase and CINAHL). Results were downloaded to reference management software and then merged using systematic review software (Covidence) and duplicates removed.

## Extraction

One author (SJ) independently screened the titles and abstracts from 11-24 February 2021, and discussed those uncertain with authors (KS, MW and MJ). Copies of the full articles were obtained for those that were potentially relevant. Inclusion criteria were independently applied to the full text

articles by two authors (MW and MJ), with reasons provided for all potentially relevant papers that were excluded. A data extraction spreadsheet was developed to capture data from the papers including: author(s), publication year, study design and instruments, sample, setting, key findings, limitations and themes.

Initial descriptions of the included studies were tabulated in a data extraction spreadsheet by three authors (ES, MW, and KS). All extracted data was checked in the spreadsheet by a second author. Initial data extraction also highlighted any recommendations or conclusions, allowing a preliminary synthesis to be conducted by looking at interactions between the objectives of M&Ms and the structures and processes used or changed in the studies.

### Data synthesis

The included studies were analysed using a thematic synthesis approach to answer the research question<sup>9</sup>. A quantitative analytic approach was not appropriate due to the heterogeneity of study designs, contexts, and types of articles included. A full-text review and thematic analysis was conducted by two of the authors (ES and BD) with discrepancies and uncertainties resolved through secondary review (completed for seven papers) and discussion. Inductive coding allowed for the emergence of themes from the data and the potential for findings beyond the original research question.

The emergent themes were organised under the categories of *structure*, *process*, *objectives*, and *outcomes* based on the research question and Donabedian's framework<sup>10</sup> for assessing the quality of health care. Prominent and recurrent themes were identified and tabulated to count the number of papers contributing to each theme with examples (Table 1). Themes were interrogated to see how they related to the research question and to explore the influence of different approaches and settings on the resulting data. The themes do not represent causal relationships between approaches to M&Ms and their effect on system improvement and staff engagement. Rather, the themes identify the recurrent concerns and factors considered important for effective M&Ms.

### Results of the search

Figure 1 shows the PRISMA selection process. After removing 365 duplicate records, 824 records were identified. Title and abstract screening review resulted in 116 records that fulfilled the inclusion criteria, for which full text of the publications was obtained. From these, 16 studies remained in the review based on the inclusion and exclusion criteria after full text review.

### Excluded studies

Studies were largely excluded due to lack of explicit focus on M&M meetings (n = 48). Further exclusions (n = 52) were due to irrelevant outcomes, conference abstract only, settings outside hospitals, non-adult population, and non-empirical studies.

### Results

The 16 studies included in this review were conducted in six countries (USA, Canada, the Netherlands, Australia, Germany and France) with most from the USA (n = 10). Most studies (n=13) used surveys of M&M organisers and/or participants and some employed additional methods including observation (n=3), interview (n=1) and document analysis (n=1).

The results of the thematic analysis are presented in Table 1, with 18 themes organised under the categories of *processes* (how) and *structures* (what, when, who) that affected M&M *objectives* (purpose) and *outcomes* (results). Each theme is described in the table using one of the included studies as an example.

The most common theme identified, under the category of *processes*, was case selection, with 15 of the studies discussing the process of selecting cases for presentation at M&Ms. Studies described case selection based on educational interest<sup>5</sup>, complexity<sup>11</sup>, errors or adverse outcomes<sup>6,12</sup>, identifiable system issues<sup>6,12</sup>, potential for prevention<sup>12</sup> or benchmarking<sup>13</sup>, and teaching value<sup>14</sup>. The existence of guidelines<sup>15</sup> or training<sup>12</sup> for case selection and the person responsible for nominating and selecting cases varied across studies, for example the most senior surgical resident<sup>16</sup> or administrators<sup>17</sup>. The second most common theme identified under the category of *processes* was M&M administration, discussed in 12 studies. As an example of this theme, Anderson et al. surveyed 129 departments of surgery in America and Canada to investigate whether a more explicit focus on quality improvement supports a more structured approach to M&Ms<sup>15</sup>. They found variation in processes used, for example most departments had senior residents presenting cases and a designated person to run M&Ms, but fewer had written guidelines for case selection. The authors hypothesised that M&Ms are perceived as opportunities for education and that the emphasis on education limits administrative activities such as record-keeping and reporting.

The most common theme identified under the category of *structures* was meeting agenda or case presentation format, discussed in 11 studies. For example, Endicott et al.'s prospective study evaluated structured presentations in a surgical department and found that the presence of a defined structure for M&Ms improved identification of adverse events and educational value<sup>16</sup>. Lecoanet et al. recommended the use of a standardised case presentation format to address the objective of education, along with dissemination of an agenda prior to meetings, and existence of a written charter<sup>6</sup>.

Under the category of *objectives*, the themes of quality improvement and education were equally prevalent (12 studies each), but some studies perceived these two themes as conflicting rather than complementary. Aaronson et al.'s survey of 151 emergency medicine residency programs in the USA found that M&Ms are still often run out of education departments and not sufficiently integrated with institutional quality improvement systems<sup>18</sup>. This contrasts with Deshpande et al.'s finding that using standardised processes for M&Ms can improve accountability and support quality improvement without compromising education<sup>5</sup>, but is consistent with Lecoanet et al.'s findings of a lack of involvement from hospital administration in M&Ms that might otherwise allow a more system-oriented process<sup>6</sup>.

System improvement and individual performance were the most common themes under the category of *outcomes* (both n=13), while clinician engagement and safety culture were coded under the theme of culture and attitudes, discussed in 9 studies. Jansson et al.<sup>19</sup> assessed the effects of anonymous M&M meetings on safety culture, whether the focus of M&M discussions was on systems versus individuals, and the willingness of clinicians to submit their cases for review. They found no effect of anonymity on the perceived educational value of M&Ms, or on whether the meeting's focus was on systems versus individual performance, but participants supported anonymity as an effective way to achieve the stated goals of a "just culture"<sup>20</sup>. Principles of "just culture" were recommended for framing M&Ms in a Dutch academic surgical department as an approach to tackle a persistent culture of blame and motivate participants to identify, plan and take actions for improvement<sup>11</sup>.

## Discussion

This study builds on an earlier systematic review<sup>7</sup> that recommended consistency in the structure and process of M&Ms. This paper analysed research published since the last systematic review in the intervening period against the same categories of goals, structures and processes of M&Ms, but also

looked specifically for a relationship between standardisation and learning, system improvement, clinician engagement, and patient safety culture. Thematic synthesis was adopted as the approach to analyse the 16 included studies, to identify the objectives, structures, and processes that may be standardised and may affect outcomes from M&Ms. The findings provide insufficient evidence to guide best practice in M&Ms, but the emergent themes describe and demonstrate the importance of the objectives on M&Ms in shaping their structures and processes, as well as outcomes.

The importance of optimal case selection to achieve an educational purpose was discussed in almost all (15 of 16) of the included studies and case analysis methods were discussed in most (10). This is consistent with the 2016 systematic review, which advocated for case selection based on pre-specified criteria and use of complication registries and framework-based analysis to identify individual and system factors<sup>7</sup>. The finding that this is still being called for in more recent papers indicates that progress on achieving optimal case selection is yet to be made. Most studies stated quality improvement (12) and education (12) as explicit objectives of M&Ms as recommended by Xiong et al<sup>7</sup>, but there were several process factors hampering that outcome such as the absence of optimal administrative support, the perception of a punitive rather than supportive environment, and lack of clinician engagement.

In response to the research question, studies noted that there was a changing focus of M&Ms over time, away from individual performance to education and quality improvement at a systems level. Yet several studies highlighted that institutions had not integrated M&Ms into quality improvement systems, despite this stated objective. Examples include the absence of<sup>15</sup> or no connection to organisational reporting systems for complications<sup>18,21</sup> and no mention of using clinical pathways or standards in the M&M discussions. Australian guidelines for conducting M&Ms emphasise the need for access to patient level data to support the M&M process, including use of data from registries and other reporting systems to enable identification of trends<sup>1</sup>. Good record keeping in M&Ms can be used by health service organisations as evidence of systems to support clinicians to review their practice and monitor variation in clinical practice and health outcomes; a strategic priority for Australian health service organisations<sup>22,23</sup>. This review focused on M&Ms but not other methods or systems used by health service organisations to improve systems, and this is a limitation that could be addressed in future research. The existence of alternative methods and parallel systems for investigating clinical incidents or focusing on system improvement may explain some of the variation in focus of M&Ms.

The reviewed studies discussed some of the barriers and facilitators of change encountered by researchers seeking to assess or modify the way M&Ms are delivered to target different objectives or attain particular outcomes. For example, Chiang et al.'s<sup>17</sup> pilot M&Ms shifted the focus from education to systems and quality improvement activities and these authors emphasised the extensive consensus building required to balance requests from clinical and executive stakeholders. They commented on the lack of crossover between M&Ms and departmental quality improvement workflows prior to the pilot, and the structural and cultural changes needed to bring the two together that the pilot detected. Bear et al.<sup>24</sup> suggested that differences in clinical leaders' understanding of quality improvement terminology and processes limited the effectiveness of M&Ms. Terminology was also discussed as a challenge by Wittels et al.<sup>21</sup>, noting that residents were more likely to report cases or near misses to M&Ms than to Patient Safety Reporting Systems (PSRS) despite the clear overlap in M&M and PSRS goals of identifying and investigating errors to learn and improve clinical skills and systems. This highlights the significance of the historical and cultural context of M&Ms which often focussed on errors or failures of individuals, as distinct from quality improvement or clinical governance paradigms which apply a systems lens. The authors of the

earlier systematic review on M&Ms commented on the significant differences between medical and surgical departments in their delivery of M&Ms, noting no direct evidence to justify the differences<sup>7</sup>.

The research question sought to establish whether clinician engagement and patient safety culture might be improved through a standardised M&M structure. This review focused on structures and processes regarded as important in M&Ms which are potentially more effective when proceeding in a standardised rather than ad-hoc or locally derived manner. The quality of the studies was not evaluated, so the relative importance of the themes identified was based only on those most commonly coded through the thematic synthesis. The emergent findings suggest that in addition to being an outcome from standardised M&Ms, clinician engagement and patient safety culture might be prerequisite for effective M&Ms. Analysis highlighted the importance of the organisation setting clear objectives, defining roles, and allocating resources for leaders and participants in M&Ms. Approaches that gave participants specific roles or engaged them in a formal structure were used to increase clinician engagement and enact change in systems. Examples include providing a framework for analysing or presenting cases, and encouraging participation in the selection, analysis, presentation and follow up of cases and resulting quality improvement initiatives. Resources and support in the form of dedicated time or administrative support to ensure timely and systematic operation of M&Ms also enhanced participation and outcomes from M&Ms.

Findings from this review connect M&Ms to governance, particularly because success of these strategies may be dependent on leadership in the organisation. The National Safety and Quality Health Service (NSQHS) Standards in Australia require leaders of health service organisations to develop a culture of safety and quality improvement and monitor their organisation's progress<sup>25</sup>. In New South Wales, the Clinical Excellence Commission published guidelines for Conducting and Reporting M&Ms in 2020<sup>1</sup>. The guidelines are built on six principles identified through a literature review and stakeholder consultation: safety; multidisciplinary; meeting framework; comprehensive discussion; lessons learned; and governance. Clinical governance literature highlights ongoing tension between the power and influence of management clinicians<sup>26</sup>, and expectations that M&Ms achieve both education and system improvement objectives may expose this tension. For example, this review found that the objectives and outcomes of M&Ms are perceived differently depending on clinical discipline, specialty and seniority. While multidisciplinary participation in M&Ms could promote safety culture and facilitate a greater focus on system improvement, it may not be welcomed if imposed on M&Ms run from those specialties with an education focus and culture. A key factor in success for change may be to let clinical staff identify issues and solutions for improving M&Ms, so that they are empowered and motivated to improve their specific setting rather than feeling coerced by top-down directives. This would require management to take a subordinate role and look for ways to balance clinical autonomy with accountability<sup>27,28</sup>.

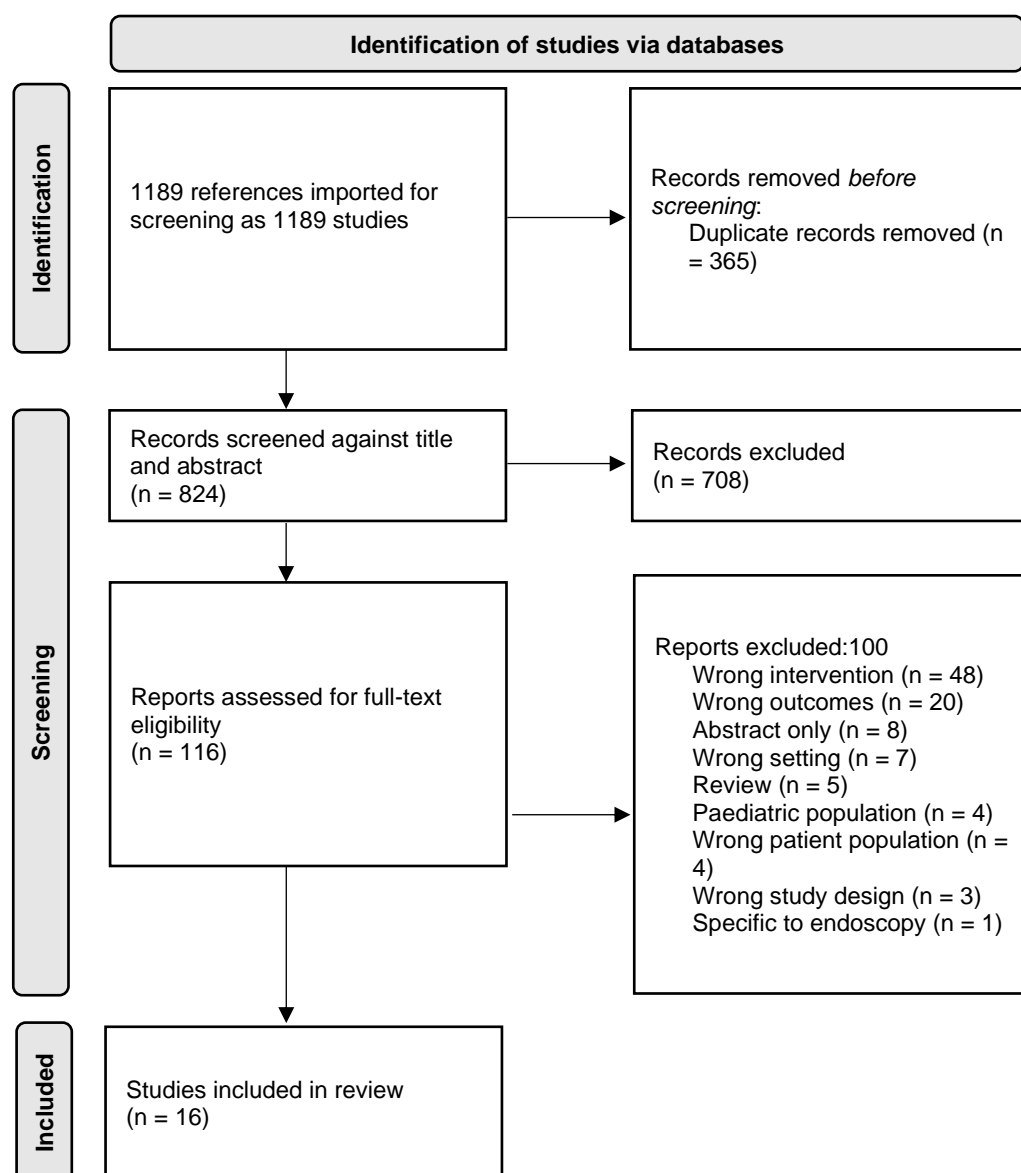
## Conclusion

This systematic review investigated processes of M&Ms and their relationship to learning, system improvement, clinician engagement and patient safety culture. Reviewed studies discussed variations of standardised structures and processes implemented to improve the effectiveness of M&Ms. The variation in and ambiguity of objectives of M&Ms in the reviewed studies made it difficult to answer the research question and identify evidence for best practice. Structures and processes for selecting, analysing and presenting cases, along with organisational leadership and administrative support were key themes discussed. These were reported to result in M&Ms that can address objectives related to education and system improvement and studies discussed contextual factors affecting the priorities and outcomes from M&Ms.

Historical and local contextual factors should be considered when modifying structures and processes of M&Ms. Assumptions that M&Ms can fulfil both learning and system improvement objectives are ambitious. Changes to the structures and processes of M&Ms are perceived differently depending on participants' role and discipline, and clinician engagement is critical to support a culture of safety and quality improvement. Attempts to integrate with quality improvement systems should consider clinician engagement and a culture of safety as pre-requisites for effective M&Ms.



Figure 1 – PRISMA flow chart



## Online Appendix – Search terms

Database	Search terms	Results
Pubmed	(((("morbidity and mortality meeting*" [Title/Abstract]) OR ("morbidity and mortality conference*" [Title/Abstract])) OR ("morbidity and mortality review*" [Title/Abstract])) OR ("morbidity and mortality round*" [Title/Abstract])) OR (((("morbidity & mortality meeting*" [Title/Abstract]) OR ("morbidity & mortality conference*" [Title/Abstract])) OR ("morbidity & mortality review*" [Title/Abstract])) OR ("morbidity & mortality round*" [Title/Abstract])) OR (((("mortality and morbidity	391

	meeting*[Title/Abstract]) OR ("mortality and morbidity conference*[Title/Abstract])) OR ("mortality and morbidity review*[Title/Abstract])) OR ("mortality and morbidity round*[Title/Abstract])) OR (((("mortality & morbidity meeting*[Title/Abstract]) OR ("mortality & morbidity conference*[Title/Abstract])) OR ("mortality & morbidity review*[Title/Abstract])) OR ("mortality & morbidity round*[Title/Abstract])) OR (((("M&M meeting*[Title/Abstract]) OR ("M&M conference*[Title/Abstract])) OR ("M&M review*[Title/Abstract])) OR ("M&M round*[Title/Abstract]))	
Embase	((("morbidity and mortality conference*"):ab,ti) OR ((("morbidity and mortality meeting*"):ab,ti) OR ((("morbidity and mortality review*"):ab,ti) OR ((("morbidity and mortality round*"):ab,ti) OR ((("mortality and morbidity conference*"):ab,ti) OR ((("mortality and morbidity meeting*"):ab,ti) OR ((("mortality and morbidity review*"):ab,ti) OR ((("mortality and morbidity round*"):ab,ti) OR ((("morbidity & mortality conference*"):ab,ti) OR ((("morbidity & mortality meeting*"):ab,ti) OR ((("morbidity & mortality review*"):ab,ti) OR ((("morbidity & mortality round*"):ab,ti) OR ((("M&M conference*"):ab,ti) OR ((("M&M meeting*"):ab,ti) OR ((("M&M review*"):ab,ti) OR ((("M&M round*"):ab,ti)) AND (framework:ab,ti OR standardi?ed:ab,ti OR document:ab,ti OR structure:ab,ti OR report:ab,ti OR system:ab,ti OR standard:ab,ti OR model:ab,ti OR agenda:ab,ti OR process:ab,ti OR program:ab,ti OR procedure:ab,ti OR record:ab,ti)	591
CINAHL	( AB ( "morbidity and mortality meeting*" ) OR AB ( "morbidity and mortality review*" ) OR AB ( "morbidity and mortality conference*" ) OR AB ( "morbidity and mortality round*" ) OR TI ( "morbidity and mortality meeting*" ) OR TI ( "morbidity and mortality review*" ) OR TI ( "morbidity and mortality conference*" ) OR TI ( "morbidity and mortality round*" ) ) OR ( AB ( "morbidity & mortality meeting*" ) OR AB ( "morbidity & mortality review*" ) OR AB ( "morbidity & mortality conference*" ) OR AB ( "morbidity & mortality round*" ) OR TI ( "morbidity & mortality meeting*" ) OR TI ( "morbidity & mortality review*" ) OR TI ( "morbidity & mortality conference*" ) OR TI ( "morbidity & mortality round*" ) ) OR ( AB ( "mortality and morbidity meeting*" ) OR AB ( "mortality and morbidity review*" ) OR AB ( "mortality and morbidity conference*" ) OR AB ( "mortality and morbidity round*" ) OR TI ( "mortality and morbidity meeting*" ) OR TI ( "mortality and morbidity review*" ) OR TI ( "mortality and morbidity conference*" ) OR TI ( "mortality and morbidity round*" ) ) OR ( AB ( "mortality & morbidity meeting*" ) OR AB ( "mortality & morbidity review*" ) OR AB ( "mortality & morbidity conference*" ) OR AB ( "mortality & morbidity round*" ) OR TI ( "mortality & morbidity meeting*" ) OR TI ( "mortality & morbidity review*" ) OR TI ( "mortality & morbidity conference*" ) OR TI ( "mortality & morbidity round*" ) ) OR ( AB ( "M&M meeting*" ) OR AB ( "M&M review*" ) OR AB ( "M&M conference*" ) OR AB ( "M&M round*" ) OR TI ( "M&Mmeeting*" ) OR TI ( "M&M review*" ) OR TI ( "M&M conference*" ) OR TI ( "M&M round*" ) )	207

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