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Continuous quality improvement in Australian aged care facilities

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Abstract

Title: Continuous quality improvement in Australian aged care facilities.

Keywords: aged care, action research, continuous quality improvement (CQI), statistical process control (SPC) tools, indicators.

Category of paper: Research paper

Purpose of the research/paper: This study examines the continuous quality improvement process in Australian aged care organisations. In particular, it seeks to identify what measurement and monitoring instrument is best suited to monitor and measure the impact of changes in the Australian Aged Care Standards.

Methodology: Action research

Findings: The study finds that an indicator system can monitor and measure the impact of continuous improvement processes of the Australian aged care outcomes. The general level of knowledge and understanding of the use of CQI in aged care improved following workplace education and training. In particular, knowledge of data collection techniques improved among the aged care workers who participated in this project. The study finds that action research projects can increase workplace knowledge and improve work practices.

Implications for theory: The study demonstrates that action research methodology can be used to develop a scientific and clinically significant indicator data collection system.

Implications for practice: The paper demonstrates that changes in work practices require education, not just changes in policies and processes.

Value of the paper: The findings of this research will be valuable to academics, practitioners, managers, consultants, and policy makers in the aged care industry.

Number of pages: 29

Number of tables/figures: 2

Section headings: Introduction and background to the research, literature review, methodology, discussion and conclusion.

Introduction and background to the research

Australian aged care facilities must meet their 'accreditation requirement' under the Aged Care Act 1997 to be eligible to receive the federal government care subsidy. Aged care facilities must be accredited by the Aged Care Standards and Accreditation Agency. Continuous Quality Improvement (CQI) is the seminal principle in this accreditation system.

The development of a measurement and monitoring system in aged care organisations may be thought to be simple, straightforward and easy to achieve. However, aged care organisations are part of the service industry and there are many intangible factors involved in the delivery of care. For example, the impact of CQI in care delivery is based on the customers' (residents and families) perceptions of care. The customers' view of quality is not always clear, as they are sometimes unable to directly express their views on the quality of the service they receive.

Under the Australian accreditation system for aged care, there are four broad standards which generate 44 aged care outcomes. The four standards are:

Standard 1: Management Systems, Staffing and Organisational Development

Standard 2: Health and Personal Care

Standard 3: Resident Lifestyle

Standard 4: Physical Environment and Safe Systems

(Department of Health and Family Services 1997)

The fundamental issue is that the standards are very broad to cover all aspects of care delivery. Each aged care standard has a number of outcomes, which are also quite broad so that they can apply to different levels of care needs in any Australian aged care organisation. In addition, not only are the outcomes broad, they are also intangible and subjective. For example, the pain management outcome states that "All residents are as free as possible from pain". Pain is tangible to the sufferer but intangible to a carer. Identification of pain is difficult, as is assessing the level of pain. Some residents suffer constant pain due to medical conditions. No medication or other therapies can free the person from pain but he/she can learn to cope with it.

Due to the way in which many of the aged care outcomes are expressed, it is more appropriate to monitor and measure the processes leading to the outcomes rather than just attempting to measure the outcomes alone. For example, it is more appropriate to measure and monitor the processes in place to alleviate a resident's pain, rather than measuring and monitoring the outcome of his/her pain after treatment or therapy.

Due to the level of subjectivity and difficulty in measuring some of the outcomes, the data collection tools necessary to measure continuous improvement need to be selected very carefully. The analysis of data must be done with a clear understanding of what is required to improve. There should be a clear understanding of improving each outcome, so the data collection focuses either on monitoring the process or on measuring the improvement. Otherwise, the data are neither reliable nor valid. Without a basic understanding of the concept of measurement and monitoring, staff in aged care organisations may not have the knowledge and skills to measure quality improvement and may try to tamper with the data to achieve "good" results, that is, results that are perceived to be desirable.

The measurement of continuous improvement involves identifying the "variation", or significant changes in the processes and systems. The most appropriate way to identify

variation in the processes and systems is with the use of indicators and statistical tools and techniques to analyse data. The CQI process for aged care standards, like continuous improvement in general, should be focused on reducing variation in the processes and systems of care and service delivery.

In theory and in practice quality improvement cannot progress without appropriate and adequate measurement and monitoring systems (Berlowitz et al. 2003; Bowen, Chase & Cummings 1990; Bowers & Kiefe 2002; Bowling 1997; Bravo et al. 2002; Carey & Lloyd 1995; Chow-Chua & Goh 2002; Crosby 1989; Deming 1986; Donabedian 1966; Donabedian 1980; Grönroos 1991; Juran 1988; Ovretveit 1998; Ovretveit 1999).

The main focus of this research is on the implementation of a monitoring and measurement system against the 44 Australian Aged Care Outcomes. While aged care assessors have been investigating aged care organisations and rating them compliant against the outcomes for some years, the exercise is very qualitative and subjective. It has relied heavily on the experience of particular assessors in various aged care organisations, and this has inevitably led to varying perceptions of what constitutes “acceptability”. Quantitative measuring and monitoring of the impact of CQI in aged care outcomes is lacking, and the present study endeavours to extend knowledge and understanding of this emerging area of quality improvement research.

The objective of this research is therefore to develop and implement a quantitative indicator system to monitor and measure the aged care outcomes, in order to verify the impact of the CQI process on the quality of care in aged care delivery.

The research endeavours to answer the following questions:

1. What level of understanding do employees in aged care organisations have on the subject of monitoring and measuring the impact of the CQI process in aged care outcomes?
2. To what extent do employees in aged care organisations use statistical tools to identify the variation in process and systems?
3. Can simple quantitative indicator tools be developed to assist staff to reliably measure CQI against the Australian aged care outcomes?

Literature review

One of the earlier writers of healthcare measurements, Donabedian (1966) referred to three approaches to quality measurement and monitoring: structure, process and outcome. He stated that all three approaches are complementary and should be used in a combined way. The literature on organisational effectiveness frequently refers to performance indicators (Chow-Chua & Goh 2002; Gitlow et al. 1989; Harrigan 2000; Kueng 2000; Lemieux-Charles et al. 2003; Lohr 1987).

CQI emerged when W. Edwards Deming (1986) introduced Total Quality Management (TQM) to the reconstruction of Japan’s manufacturing industry after World War II in 1950. Deming’s version of TQM was based on Shewhart’s (1931) concept of statistical process control.

Gabor (1990) has agreed with quality improvement leaders that all systems are subject to some amount of variation that leads to inconsistency and, eventually, to an erosion of both

process and product quality. Inconsistency makes it difficult for management to predict how its systems and strategies will perform, which means the quality of the product or service will fail with ultimate loss to the organisation.

Service industries see quality as a marketing tool; therefore, definitions and theories are based on a marketing perspective. Many writers (Grönroos 1991; McNeil 2000; Parasuraman, Zeithaml & Berry 1988) define service quality as meeting customers' needs and expectations, resulting in improved customer satisfaction.

Quality in healthcare has been judged by patients, practitioners, providers and the public in many different ways. The patient perspective of quality of care is dependent on accessibility of the care, how efficiently they received the care, who they received it from, how quickly they received it and how kind the doctors and nurses were at the time of care delivery, to name a few factors. According to Donabedian (1980), patients' perspectives of quality in healthcare are based on the 'processes of care'.

Jaeger et al. (1994) stated that most significant CQI work in healthcare was done by three physicians around the mid 1980s. They are Paul Batalden at Hospital Corporation of America (HCA), Donald Berwick at Harvard Community Centre and Brent James at Inter-Mountain Health System. Jaeger et al. (1994) indicated that the Deming process is especially useful in healthcare because professionals already have knowledge of the subject matter and have a set of values and disciplines that fit the Deming philosophy. Deming argued that managers must have a "profound knowledge," that is, managers must learn about organisational and environmental changes and incorporate that learning into management practice.

In comparing the CQI process in the manufacturing and the healthcare industries, Jaeger et al. (1994) observed that in the manufacturing industry CQI processes have linear flows, repetitive cycle steps, standardised inputs, high analysability, and low worker discretion. On the other hand, health industry CQI processes involve non-standardised and variable inputs, non-repetitive operations, unpredictable demand peaks and high worker discretion.

Donabedian (2003) discussed when and how to monitor healthcare delivery. According to him, there are three types of monitoring:

1. prospective or anticipatory,
2. concurrent, and
3. retrospective.

Prospective monitoring

Prospective or anticipatory monitoring is the attempt to pass judgment on a proposed clinical event or intervention before the event occurs or the intervention is implemented.

Concurrent monitoring

Concurrent monitoring occurs during the course of care, either periodically as a routine or when something happens that triggers a review of the way care is being handled. Concurrent monitoring as part of a quality assurance system is simply a formal plan by which, at critical junctures in the care of a patient, someone other than the care giving practitioner assesses the progress of the care and, if needed, offers advice or perhaps actually intervenes.

Retrospective monitoring

Retrospective monitoring is done by reviewing a sample of medical records. It makes use of the records as well as additional information, if needed, to make a judgment on the quality of care.

In summary: *prospective monitoring* prevents care of a certain kind from ever being given; *concurrent monitoring* allows one to intervene and, if necessary, interrupt care or alter its course; *retrospective monitoring* cannot do either of the above, but it does teach one, when errors in care are discovered and their causes are understood, how to do better in the future.

Donabedian (1980) said that validity is the most important factor involved in the outcome of the monitoring and measurement process. Sensitivity and specificity are central to the validity of all measurements. Validity covers two domains:

1. Accuracy of the data and the precision of the measures that are constructed with these data.
2. The justifiability of the inferences that are drawn from the data and the measurements.

According to Donabedian (1980) the accuracy and completeness of information obtained from medical records, and other documents and reports, and even direct questioning is always questionable. Validity of data is divided into two categories: causal validity and attributional validity. Causal validity refers to the capacity of specified processes to produce specified outcomes under specified conditions. Attributional validity refers to the inference that in any particular situation that capacity accounts for the actual observations.

Statistical process control tools can be used in the healthcare industry to identify and analyse prospective, concurrent and retrospective assessment data in improving healthcare for either preventive, interventive and/or remedial actions. McLaughlin et al. (1994) suggests the following seven steps for CQI in healthcare:

1. Problem identification
2. Observation
3. Analysis
4. Action
5. Check
6. Adopt
7. Conclusion

McLaughlin et al. (1994) explained how statistical tools and techniques are most useful in the problem identification, observation and analysing steps.

The healthcare industry has been using mortality and specific morbidity rates as indicators to measure quality of care for centuries. Over the years, healthcare experts have called indicators by various names - quality indicators, performance indicators and clinical indicators, to name a few. Van der Bij et al. (1999) presented a framework of performance indicators and related measurement tools to monitor and evaluate healthcare processes after reviewing three case studies which were performed in different hospital settings (Dutch healthcare). In their view, monitoring means objective measurement of certain aspects of current status. Thus, a monitoring system is a representation of a measurement system. The aim of monitoring can be either control or evaluation. To be able to control an object system,

they argued, based on Hofstede's (1981) work, that certain requirements should be available. These are:

- Standards are available and unambiguous;
- Outputs are measurable;
- Effects of management interventions are known;
- Activities within the object system are repetitive.

Gray (2001) reviewed the Australian Aged Care Accreditation process. The review noted that the capacity of the Accreditation Agency to ensure quality of care was reliant on its ability to identify formal recorded processes and practices, and that its relative weakness in this regard related to the link between reports of care and the actual care delivered.

In May 2003, the Australian National Audit Office (ANAO) released its Performance Audit on managing residential aged care accreditation (ANAO 2003). This report covered a number of issues and recommendations in relation to the internal mechanisms of the Accreditation Agency. It noted that the Agency does not yet have a way of assessing the outcomes of its accreditation and monitoring work on the residential aged care industry, and is unable to measure if and how it is achieving its vision that individuals enjoy quality care and services provided by an aged care industry that is setting world benchmarks. The ANAO has suggested that the agency develop indicators to measure and demonstrate sustainable improvement across the industry over time.

A lot has been written on the quality of services in general and on the health and aged care services in particular (Deming 1986; Grönroos 1991; Juran 1988; McNeil 2000; Parasuraman, Zeithaml & Berry 1988). Despite this, there are a number of gaps in the literature. Firstly, there is only one tool, SERVQUAL, that has been recognised universally as a reasonably valid tool to measure quality in the service industry (Parasuraman, Zeithaml & Berry 1988). However, the framework of the accreditation systems in the service industry provides recognition of a quality service. The accreditation framework provides the set of standards which service providers must meet or exceed by continuously improving their services.

This concept is not new to health and aged care service providers. The accreditation process in health and aged care includes performance improvement concepts and standards that help healthcare organisations and professionals to continuously improve the quality of service and care by focusing on outcomes. Therefore, the measurement of quality practices is essential if quality is to be managed effectively and the CQI cycle is to work in practice. Measurement overcomes some of these semantic difficulties and provides a means by which comparisons can be made and by which improvements can be detected (NSW Health Department 1999).

The UK, Canada and the Netherlands are at the forefront of using indicator systems to measure aged care service delivery. The indicators play a major role for the quantitative method of measurements. There are many indicators. Some of these include clinical indicators, prevalence indicators, performance indicators and observable indicators used to measure quality care. However, these indicators measure part of the outcome or standard and not the whole outcome or standard.

Methodology

Action research was selected as the methodology for this study as it is best suited to the research problem, which is based on actual practices in aged care and the CQI process. After the literature review and extensive study of the assessment pattern of the Australian aged care accreditation method, it was clear that the aim of this research was to develop quantitative indicators that can be used to measure and monitor the impact of continuous improvement in Australian aged care outcomes.

The sites selected for this study were private aged care organisations with fewer than 100 beds. There were two reasons for selecting small facilities. Firstly, small facilities do not have the resources that large organisations have, yet they are to achieve accreditation in the same way as large organisations. Moreover, they are more likely to welcome the researcher's assistance and participate in the research.

Secondly, the researcher determined that it would be easier to implement, monitor and control the action research cycles in smaller organisations, as their decision-making infrastructure and processes make it less administratively cumbersome to achieve an outcome in an acceptable time frame.

The case study sites for this action research were five aged care organisations, all of which had achieved full aged care accreditation between the years 2000 and 2001 and continue to receive Commonwealth Government funding. The organisations have been de-identified and are listed in Table 1 as organisations 1-5.

Table 1: Research sites

Organisation No.	Area	Level of Care Delivery	Bed numbers	Number of Staff, Including Registered Nurses
1	Metro	Low care	30 beds	20 Personal Care Attendants. Registered Nurse Div 1's input – limited number of hours Monday to Friday.
2	Metro	High care	30 beds	20 Personal Care Attendants and 10 Registered Nurse Div 1 input – 24 hrs a day.
3	Rural	Low care	45 beds	40 Personal Care Attendants. Registered Nurse Div 1's input – limited number of hours Monday to Friday.
4	Rural	Low care	35 beds	30 Personal Care Attendants. Registered Nurse Div 1's input – limited number of hours Monday to Friday.
5	Metro	High & low	79 beds	40 Personal Care Attendants and 20 Registered Nurse Div 1 input – 24 hrs a day for high level care residents.

Source: Developed for this study.

As an action research study, the study involved change interventions aimed at improvement and involvement. It involved a cyclical process in which research, action and evolution are interlinked and embody a research relationship in which those involved will participate in the change process. The study involved a staged approach.

The preparation stage

The design of the practical steps of action research was an important part of the research.

There are two major factors involved in this research problem. The first is that the aged care standards are broad and complex, and the second is that it is assumed that the majority of employees in aged care are unsure of the application of CQI to the aged care standards and the use of statistical process control tools and techniques.

The literature search indicated that the implementation of CQI is difficult in any industry setting, and exceptionally so in the healthcare industry as there are so many intangible and emotional factors involved in care delivery. Therefore, improving staff knowledge and skills in participative aged care organisations was imperative in this study.

First, the staff level of understanding of CQI concepts, data collection systems and indicator data collection systems, especially in relation to aged care outcomes needed to be ascertained. If the level of understanding was low, education and training in CQI principals needed to be developed and delivered.

Accordingly, a staff pre-education survey was developed to identify the level of respondents' knowledge of elements of CQI and data collection systems with indicators (Appendix 1). The results of the survey indicated that staff knowledge of CQI was negligible or low.

The education and training stage

Having established that staff knowledge of CQI at the test sites was low, an appropriate education and training program was developed and training sessions on CQI and data collection methods were scheduled and conducted.

A two-hour training session was developed by the researcher to educate the staff of the organisations. The session covered aged care outcomes, basic knowledge of the CQI concept and data collection techniques.

Trainees were also taught how to examine and interpret data, write up an action plan, develop time frames for action to be taken and identify responsible persons for certain action. Staff in the aged care organisations already knew their scope of practice and overall responsibility for each activity required for each aged care outcomes. Education and training sessions were open to all staff but attendance was limited to 10 staff at any given session. The two-hour sessions were held once a week for eight weeks.

After eight weeks of education and training sessions, a post-education survey was conducted at the research sites to identify the trainees' level of understanding of CQI.

Evaluation of the education and training stage

The pre- and post-education surveys asked respondents to record a score of 1 to 5 for each question. A score of 5 indicated a clear understanding of the guidelines and principles of aged care outcomes, while a score of 1 indicated no understanding. To evaluate if the education program made a difference to staff understanding of CQI, a t-test was carried out for each response level. A summary of t-test results are shown in Table 2.

Table 2: Summary of Differences in Mean Scores in Pre- and Post-Education Program

Response level	1	2	3	4	5
Mean of responses: Pre-education	12.45	13.08	16.77	17.81	11.15
Mean of responses: Post-education	0.54	1.92	23.85	28.85	15.96
Df	26	36	45	38	42
t Stat	- 7.43	- 10.13	5.14	7.35	3.11
P	<0.001	<0.001	<0.001	<0.001	<0.0017

(Ø one – tail t-Test: Two – sample Assuming Unequal Variances)

Source: Developed for this study.

Table 2 indicates that in all cases highly significant changes in the mean response levels were achieved. Fewer respondents indicated lack of understanding of aged care outcomes. Response levels 1 and 2 after the education are low, and markedly more respondents indicated a greater understanding and acceptance of the aged care outcomes (response levels 4 and 5). This implies that the training program was very effective in educating the aged care staff in CQI.

Having established an environment of awareness and knowledge of CQI and the aged care standards at each test site, the next task was to use the action research process to develop suitable quantitative indicator tools to measure the aged care outcomes.

Developing the improvement indicator system

The improvement indicators are based on Donabedian's (1980) theory structure, processes and outcome of care delivery. Improvement indicators are multifaceted. Some improvement indicators measure and monitor the structure of the outcomes, which indicates organisational ability to meet the care and service needs of the residents. Others measure and monitor the processes that focus on actual care delivery (technical quality), which indicates how well the care has been delivered to residents. Some improvement indicators also focused on monitoring risks and best practice methods.

The improvement indicators were developed by taking into account the core characteristics of the aged care outcomes on the basis of the researcher's experience in aged care. The tool was relatively unsophisticated and not previously peer reviewed. Due to the expected commercialisation of the indicator system, examples of the indicator tools cannot be provided in this paper.

The action research approach was used to refine the quantitative indicator system. Dick (1993; 2000) has said that in action research each cycle is small because there are multiple cycles in one study. Each cycle's facts are confirmed or disconfirmed. Because of this convergent nature of the process, the more detailed information collected in the later cycles supersedes earlier data.

The important characteristic of each cycle is that the researcher plans before acting, and reflects on the findings and the method after acting. The reflection at the end of each cycle feeds into the planning for the next cycle (Dick 1997).

The first action research cycle

The first cycle of action research commenced to refine and validate an improvement indicator measurement tool developed by the researcher. At the first cycle of the action research process, staff were delegated to collect data with the improvement indicators for one or two aged care outcomes. A hard copy of the indicator data collection tool and explanatory notes were given to the staff. The purpose of the explanatory notes was to facilitate staff understanding of the data collection process.

Staff were instructed to hand in the completed improvement indicator data collection tools to the quality person or the researcher. The researcher developed a Microsoft Excel spreadsheet for data entry. Quantitative data were entered into the spreadsheet as yes = 1 and no = 0 and bar graphs were created as graphic presentation.

The reflection stage of the first cycle was to become important to this research as data were collected qualitatively and quantitatively. While improvement indicators collect quantitative data, qualitative data came from multiple methods. Staff opinion on CQI in aged care, the improvement indicators, implementation method etc., came through formal and informal meetings and discussions.

This information was then converted into issues. Some of the issues arising from the reflection stage were:

- some data required for the improvement indicator tool did not fit into 'yes' and 'no' responses.
- data needed were not readily available.
- data were not easily accessible.
- staff were not clear or confident about how to examine the data and write up action plans to address the issues that emerged.
- staff were reluctant to take action on some of the identified issues due to many factors, such as:
 - they were not involved in the decision-making process.
 - they did not have the knowledge and skill to take action.
 - some actions were not within their scope of practice – within the legal framework.
- staff involvement in data collection was not satisfactory despite the fact that they were invited to be involved in the process at the beginning.
- what would be the best way to analyse data and present reports?
- no resources were allocated for quality improvement work. Time was allocated for data collection only and management was expecting staff to collect data plus perform their day-to-day duties.

The above qualitative data had direct impact on this research and it was also time to look at the quantitative data collected with the improvement indicator data collection tool. The main issues involved the health and lifestyle outcomes (Aged Care Standard 2 & 3), where data collection was focused on residents.

The main concern was sampling error. Staff were choosing random samples for all outcomes. At this stage the improvement indicators were designed for 'yes' and 'no'

responses. However, some of the data were not clearly defined for the 'yes' and 'no' categories because some of the processes had commenced but had not been completed. For example, one indicator asks 'has this resident's care needs been assessed?' Staff could not respond yes or no because the assessment had commenced but had yet to be completed.

On the other hand, when information was sought for a particular indicator, staff were responding 'no' to some residents' data because that particular indicator information was not available from the resident documents due to the resident not experiencing that particular issue. For example, one indicator for the pain management outcome asks 'has this resident's pain been assessed?' Staff responded 'no' because the resident did not have a pain assessment because he or she did not experience pain.

Parasuraman et al. (1988) indicated that products in the service industry are intangible and the CQI processes in this industry must focus on understanding the gap between the expected delivery quality and actual delivery quality.

Taking into consideration the discussed issues above, the following action was taken to improve the indicator measurement tools:

1. The researcher was concerned with how and what would be the accepted performance levels when the quantitative data were analysed. The normal curve six sigma theory was adapted to decide the level of compliance.
2. The type of responses for the indicators needed to change and more responses were required to accommodate the processes. The responses for the improvement indicators were modified. In addition to the 'yes' and 'no' responses, further response categories were added, including 'uncertain' and 'does not apply' for the second cycle of data collection.

The second action research cycle

Besides the addition of extra response categories, some of the indicators' structures also needed to change to capture relevant information from the literature search. Thus the improvement indicator version 2 was created.

The same process used for version 1 of the tool was employed to collect data with version 2. The staff were again given a hard copy of the indicator data collection tool with explanatory notes, even though the notes had not been changed.

At this stage, staff were a little more enthusiastic and involved in data collection as their views were taken into account in modifying the improvement indicator tools, and the CQI meetings them the opportunity to raise other housekeeping issues.

Staff were instructed once again to hand in completed improvement indicator tools to the quality person or to the researcher. The time taken to collect data was different for the different staff members as well as for the different organisations.

At the reflection stage of the second action research cycle, the researcher decided to remove the 'uncertain' response category and replace it with an 'in progress' response category. The lack of staff education and training on aged care expected outcomes was also recognised and an extra indicator was added for each outcome to monitor staff education and training levels.

The third action research cycle

The same process used for versions 1 and 2 of the tool was used to collect data with version 3. This time the staff were given a hard copy of the improvement indicator data collection part of the tool without the explanatory notes, as most of the staff at this stage were confident of collecting data with the indicators.

Following data collection, graphic presentations and explanation given to the staff on how to identify variation in the process of the related outcomes. At this stage staff said that they felt the data collection was much easier. This may have been due to their understanding of the data collection tool, the greater sophistication of the tool, the streamlined filing system and allocated time for data collection.

Care delivery is a multifaceted process and these processes have different levels of variation. Data collected through the improvement indicators did not demonstrate the level of variation in the processes of care. The CQI process in aged care cannot be introduced without identifying variation in the processes of care delivery.

Allocating values to 'yes', 'no' and 'in progress' response categories were producing categorical data but still not representing the level of improvement of care and service delivery, nor identifying the variation in the process of care.

Data collection for the health and lifestyle outcomes was divided into two categories, random and target data collection being designated for each outcome. The main purpose of the indicators was to flag changes and the 'does not apply' category did not fit into the indicator data collection system. For example, the pain management outcome indicators will collect data only from the medical records of residents who are on any kind of analgesic (pain relieving) medication at any stage.

At this reflection stage (cycle 3), the researcher decided to remove all 'yes', 'no', 'in progress' and 'does not apply' response categories and allocate a value system (scale) to the actual activity required to meet each indicator, and to consolidate all of the above information.

The researcher examined each individual indicator of each outcome from a risk management point of view before allocating values to each indicator. Risk assessment was conducted to identify the common as well as special causes of variation for each indicator, using Donabedian's (1980) input, process and outcome framework for conducting risk assessments.

The final action research cycle

At this stage, the indicators were replaced with a numerical scale. The main purpose of allocating numeric scales was to identify the level of performance of each outcome in order to monitor and measure the impact of continuous improvement in care and service delivery, over a period of time.

Staff education sessions were held to explain the new data collection responses. The same process used for version 1 of the tool was employed to collect data with version 4. Staff were given a hard copy of the indicator data collection tool without explanatory notes as they were not changed.

At the reflection stage of this cycle the researcher found that few staff had difficulty understanding the symbols (>, <), and most found writing up action plans was comparatively easy.

Discussion

Carey (2002) stated that we need to monitor our treatment processes and determine whether they are functioning at a consistent and acceptable level as measured by one or more criteria. Determining the effectiveness of care under clinical conditions requires a different approach than that used in basic research. By using parametric statistics, such as a t-test or analysis of variance, one can determine whether the treatment had a statistically significant effect. Such a study is valuable in determining the efficaciousness of an intervention but not its effectiveness under clinical conditions of practice (Carey 2002, p. 81).

Carey (1995) stated that, from a quality improvement perspective, data should be collected in order to do the following things and take action:

- understand the variation that exists in a process.
- monitor the process over time.
- see the effect of a change in the process.
- provide a common reference point.
- provide a more accurate basis for prediction.

All participative organisations were producing the same data regardless of geographical differences and residents' level and differences of care needs. In addition, there were staff knowledge and skill differences in providing care. Considering these issues and what the literature search had raised about other indicator systems, the following questions were raised in order to validate the improvement indicator tools.

1. The options of 'yes', 'no', 'in progress' or 'does not apply' did not measure variation in the care and service process.
2. How do staff know that care is improving, maintaining or deteriorating?
3. What are the operational risks in care delivery?
4. Could meaningful data with the improvement indicators be produced to show that resident care is better than a year ago?
5. Do the indicators measure what they actually intend to measure?
6. Should they provide the same answer if measured by different people in similar aged care organisations?
7. Could the data collected through the improvement indicators be statistically analysed?
8. How does the researcher know care delivery processes are controlled?
9. Are the changes sustainable in making an impact in care delivery?
10. Could these indicators provide a series of valid and reliable data over a period of time?
11. The process stability and that changes have made an impact on care delivery is unknown.
12. Could these indicators be used as a guide to monitor, evaluate and improve resident care and service delivery?
13. What impact has CQI made in resident care, staff knowledge and skills and overall organisational improvement?
14. Are the care and service delivery processes controlled and performing at acceptable levels? What are the acceptable levels of care?

15. Are these collected data valid and reliable?
16. How can the researcher make it easy for staff to determine whether their organisation's performance (care and service delivery) is satisfactory or whether there were opportunities for improvement?

In consideration of the above data collection and analysis requirements, it was evident that data collected through the improvement indicators should be able to be statistically analysed.

Up to the third cycle, results were presented to staff of the organisations with bar charts, because data collected up to the third action research cycle could only obtain average scores for each indicator or average scores for all outcomes. Data could also have calculated a percentage of performance for each resident or a whole sample (10 residents) for individual outcomes or all outcomes. This data could then be represented in bar charts and compared with each outcome's performance. However, it has been stated that bar charts pretend to describe the effect of variances of change. It has also been stated that unless the processes that produced changes are stable, the comparison is meaningless (Carey 2002).

The researcher discussed other data collection methods and monitoring systems with quality surveyors in other fields in order to find a method suitable for this research. It has Montgomery (1997) said that control charts are good management tools and are the best to identify variations in processes. Dick (2000) added that quantitative data will be a bonus to action research. If the researcher uses quantitative data, then the data needs to be analysed statistically.

Statistical Process Control (SPC) tools and techniques are used to control processes and variation. The key aspect of quality improvement is reduction in variation in the process. The two main causes of variation in the process are assignable (or special) and common (or chance). Special causes of variation are not inherent in the process and can therefore be readily identified. The common cause of variation is always inherent in a process. SPC tools such as run charts and process control charts can be used to distinguish between special and common causes of variation.

Control charts will indicate when there is something wrong with a process and whether the process is stable or not. It will supplement the staff's analytical skills to identify what is wrong with the process.

Montgomery (1997) stated that variable control charts can be used in both manufacturing and non-manufacturing settings; the nature of the product has no bearing because measurements are taken only on the quality, function or performance of the product. However, one needs to be creative in selecting the proper variable or variables for measurement when control charts are used in non-manufacturing environments. Process capacity, or some may say capability, should also be calculated to understand the process stability.

Due to the nature of the industry it is appropriate to use process control charts to monitor the care delivery processes. This research demonstrated the importance of process monitoring charts in all aged care outcomes.

Quality of care issues are complex in aged care because there are many types and levels of care provided. The individuals in these organisations are chronically ill and/or disabled, and must depend on others to meet their most basic physical needs.

Donabedian's (1980) three approaches to quality measurement and monitoring – structure, processes and outcomes – are complementary to one another and should be used together. In the context of aged care, the structural measures assess the inputs such as the level and mix of staffing, characteristics of facilities, resources etc., while process measures examine actual services or activities provided to residents.

It is evident that the process measures in aged care must focus on improving the care process in place to overcome residents' problems such as their physical, psychosocial, cognitive, hearing, vision, continence, behaviours, nutrition and hydration, oral and dental, skin integrity care needs and medication management. Outcome measures are focused on increasing quality of life. However, quality of life is difficult to define, difficult to measure and one is not able to monitor the quality of this process. The better the quality of a process, the better the outcome will be. Therefore, outcomes measurement must be conducted in combination with the process measurement system. Hence the measurement system must be appropriate and effective.

Conclusions

This study has found that indicator data collection systems (Improvement Indicator data collection tool) is the most suitable tool to monitor and measure the impact of CQI processes because it is based on:

- scientific and clinical significance.
- the use of statistical tools to identify variation to processes and systems.

For many years, healthcare systems around the world have used indicators to monitor and measure various types of conditions. However, this is the first time this type of study has been conducted in Australia or internationally.

The research findings prove that improvement indicators can monitor and measure the process of the aged care outcomes. Consequently, this study proposes a data collection tool (Improvement Indicator data collection tool) that Australian aged care organisations might effectively use to monitor and measure the impact of the CQI process in aged care outcomes.

The study highlighted the lack of knowledge and skills of aged care workers in continuous improvement in aged care. The results of the pre- and post-education surveys confirm that staff knowledge of CQI processes in aged care, and their use of statistical process control tools and performance indicators or clinical indicators to monitor standards were both low, but their knowledge increased significantly after the education and training sessions.

The study draws attention to the fundamental element of improving either the technical or functional quality of the staff in having up-to-date knowledge, sharpened skills and improvement in their competencies. Thus continuous education and training for staff is an essential part of improving their knowledge, skills and competencies.

This study has provided conclusive evidence in each research cycle. This research model was based on Sankaran et al. (2001) and the chain of evidence of these positive changes.

Appendix 1

Pre education survey

The rating of 4 in this example would indicate that you understand this term and its practical use.

	Strongly Disagree		Neither Agree nor Disagree		Strongly Agree
1. Quality improvement terms in Aged Care					
a. I am familiar with the phrase 'continuous quality improvement'	1	2	3	4	5
b. I understand the phrase 'statistical process control (SPC)'	1	2	3	4	5
c. I understand what is meant by the 'PDCA cycle'	1	2	3	4	5
d. I understand what is meant by the 'PDCS cycle'	1	2	3	4	5
e. I am familiar with some 'statistical process tools'	1	2	3	4	5
f. I understand what is meant by the phrase 'clinical performance indicators'	1	2	3	4	5
g. I understand that standards can be effectively measured through indicators.	1	2	3	4	5
h. I believe measurement of processes will provide a clear pathway to continuous improvement.	1	2	3	4	5
i. I have used statistical process tools and techniques to monitor aged care standards expected outcomes in my aged care facility	1	2	3	4	5
j. I am aware that our aged care facility uses performance indicators to monitor standards expected outcomes	1	2	3	4	5
k. I believe data collection is a part of continuous quality improvement.	1	2	3	4	5
l. I have personally collected data to measure the aged care expected outcomes in my aged care facility	1	2	3	4	5
m. I believe data collection is part of my duties	1	2	3	4	5
n. I understand how to check for validity in the data that I collect in my aged care facility	1	2	3	4	5
o. I understand how to check for reliability in the data that I collect in my aged care facility	1	2	3	4	5
p. I understand the difference between input, process and outcome measurements	1	2	3	4	5
q. I know how to identify variations in processes	1	2	3	4	5
r. I know how to identify issues that require action/s	1	2	3	4	5
s. I am aware of the action plan process	1	2	3	4	5
t. I know how to write an action plan for identified issues	1	2	3	4	5

Source: Developed for this study.

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