Introducing casemix-based management into the home and community care sector

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Introduction
Casemix systems provide the tools to meaningfully classify, analyse, compare and price services based on an understanding of the factors that drive complexity and cost in the delivery of the services. While these systems are well established in the acute, subacute and non-acute health care sectors, the community-based care sector has not historically had the same imperatives to implement, or the information systems to support, a casemix-based approach to management.

The community-based care sector has been undergoing expansion with increasing market competition, and as a result there is growing pressure for competitive pricing and service sustainability. Using financial data and activity volumes alone does not provide the information that can explain variation and improve efficiency and resource allocation.

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Background
Silver Chain (SC) is a not-for-profit organisation providing community and home-based health and social care and assessment services. After operating for more than a century in Western Australia and as the Royal District Nursing Service in South Australia for more than 120 years, SC has now expanded into the eastern states. SC works under contract to the Commonwealth Government and various state and local governments and non-government organisations to provide community-based services, including specialist nursing, palliative and home hospital care.

In response to both the changes in the sector and the ongoing expansion of the organisation, there was recognition within SC that it needed to better understand the complexity of services provided and how the provision of different types of services drives costs. All these pointed to the need for a casemix-based approach to management.

SC engaged the services of the National Casemix and Classification Centre (NCCC) at the Australian Health Services Research Institute, University of Wollongong to provide advice and undertake the technical work required to develop such an approach. The aim of the project was to establish the capacity and capability to introduce a casemix approach to managing the services within the SC Health Division.

Study design
The study was designed to establish the key elements of the proposed casemix-based management system, which were identified as:

- Classification system
  - Clinical and resource utilisation similar groupings
  - Groups based on service and client characteristics
- Activity-based costing
  - To understand cost drivers and inform pricing
  - Development of cost weights for different services
- Casemix analytics
  - Developing the reporting systems and capabilities within the organisation.

The overall project incorporated three phases, with each phase a development step towards leadership in community-based casemix systems. The project model is provided in Figure 1.
Phase 1 involved a gap analysis to investigate the organisation’s information systems to determine whether activity-based costing and classification development could occur with the current systems. The existence of the required building blocks for a casemix-based management system was crucial for the success of the project.

Phase 2 activities included the resolution of some critical ‘gaps’ identified in Phase 1 and the completion of the largest pieces of technical work; the costing study and the development of the classification. Phase 3 was undertaken concurrently with Phase 2, with a focus on building the capacity for casemix-based management within the organisation.

Phase 1 – Setting the platform

Phase 1 activities included a literature review to research existing community-based care classifications and to identify data variables that may be used in a classification for this sector. A series of stakeholder consultations was also undertaken to obtain information about current data collections, and a review of client activity and financial data was completed. While the current data collections were found to be driven by the specific requirements of each of the service contracts, it was established that SC’s data collections were a rich resource of information, with sufficient detail and linkage capabilities to support activity-based costing and classification development. However, the gap analysis did indicate that while the existing information systems could be used for initial development, some improvements would need to be made, particularly in the areas of data coverage and consistency, to enable further development and refinement.

A list of priority issues to be addressed was prepared as part of the Phase 1 report, with two issues identified as critical, as they represented key dependencies for the costing study and classification development. These were:

- The establishment of a data governance framework to support the project
- The development of the ‘episode of care’ as the unit of counting.

A draft activity-based costing methodology was also developed with a limited (three month) costing study undertaken as a proof of concept. Key clinical variables that could be used in a classification were also identified, and a proposed conceptual approach to classification development was described.
Phase 2 – Building capacity

Two streams of work were incorporated into Phase 2; the ongoing internal systems development (including addressing the identified priority issues and resolving the two critical issues), and the technical projects (costing and classification development).

The issues of data governance for the project and the episode of care definition were addressed at the commencement of Phase 2 and led by the NCCC. Other priority issues were allocated to working groups within SC to be addressed over the course of the project and beyond.

Data governance framework

In Phase 1 it was identified that SC did not have a formalised data governance framework and, as this was unlikely to be resolved in the short term, a data governance strategy was established specifically for the project. This included a SC point of contact for each data source, with the authority to make decisions and provide advice regarding the appropriate use and analysis of each dataset.

Defining an episode of care

In costing and casemix classification, the unit of counting forms the basis of all development work and analysis. The findings of the gap analysis determined that the base unit of counting for community-based care should be a care episode. While a similar concept to an episode of care was currently being used within SC, it was generally financially driven and aligned with the service contracts.

A SC expert panel was formed to assist NCCC in the development of a working definition. It was agreed that an episode of care would be ‘the period of time in which a service (product) is provided to a person for which there is a specific goal of care.’ All health care services provided by SC were grouped into 16 different ‘products,’ for example, wound management, continence care or palliative care. This represented a significant change in the way SC were able to describe their services. In addition, eight different goals of care were defined. The definitions aligned with the Fast Healthcare Interoperability Resources episode of care (Fast Healthcare Interoperability Resources 2017) and the related Australian Institute of Health and Welfare Metadata Online Registry community care data definitions (Australian Institute of Health and Welfare 2005).

Two key triggers for a new episode of care were defined; when a new ‘product’ of care was delivered, or when the ‘goal’ (expected outcome) for the care being delivered changed.

The SC products were organised into two categories for the purposes of creating and classifying episodes. These categories determine how episodes will be treated when clients receive services across multiple products at the same time. Products were allocated to the categories based on clinical advice from SC.

Category 1 products are those that are provided as discrete services, meaning that they would not be affected by care delivered through other products (e.g. formal education). Episides in Category 1 products can occur concurrently with any other product and will always remain as separate episodes of care.

Category 2 products are those where there can be a relationship between the services provided (e.g. wound care and diabetes). Services for multiple Category 2 products are bundled as a single ‘compound’ episode. The products in Category 2 are listed hierarchically and the episode is captured against the product which is higher in the hierarchy. The allocation of products and the category definitions are shown in Table 1.

Table 1. Categories of Silver Chain Products

<table>
<thead>
<tr>
<th>Category and products</th>
<th>Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category 1 Products:</strong></td>
<td>Category 1 products can occur concurrently with any other product from either Category 1 or Category 2. Each product will be captured as a separate episode.</td>
</tr>
<tr>
<td>Remote and rural primary care</td>
<td></td>
</tr>
<tr>
<td>Health navigation</td>
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<tr>
<td>Priority response assessment</td>
<td></td>
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<tr>
<td>Consultation</td>
<td></td>
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<tr>
<td>Formal education</td>
<td></td>
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<tr>
<td>Maternity</td>
<td></td>
</tr>
<tr>
<td><strong>Category 2 Products:</strong></td>
<td>When Category 2 products occur concurrently they are not captured as separate episodes but as a single compound episode. Category 2 products are organised hierarchically and the compound episode is assigned to the highest order product in the hierarchy. For example, if a client is receiving palliative care and wound care concurrently the episode will be considered a compound palliative care episode.</td>
</tr>
<tr>
<td>Palliative care</td>
<td></td>
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<tr>
<td>Bereavement</td>
<td></td>
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<tr>
<td>Hospital at the home</td>
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<tr>
<td>Stoma</td>
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<tr>
<td>Wound</td>
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<td>Continence</td>
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<tr>
<td>Diabetes</td>
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<tr>
<td>Respiratory care</td>
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<tr>
<td>Medication management</td>
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<td>Case management</td>
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Rules to incorporate ‘on hold’ periods were also developed for circumstances where a client stopped receiving services for a time, such as during a hospitalisation.
The episode of care definition was retrospectively applied to the financial year 2016-17 data to create the first set of SC episodes in preparation for the costing study.

**Undertaking the costing study**

The costing methodology was based on the standard costing approaches that are used in the Australian health sector. However, given the very different types of client services, financial systems and organisational structure in SC compared to the largely hospital-focussed costing systems, the approach was tailored and adjusted as required. Key features of the costing study were that:

- The methodology used data that were currently captured routinely by SC (i.e. there was no requirement for any new sources of data)
- The proportion of costs related to the delivery of health services versus other SC services was determined as an output of the costing process
- Costing was based on a full absorption method, where the total organisational expenses were accounted for and total in-scope costs were allocated across all client activity (episodes of care)
- Corporate, indirect and direct care costs were allocated differently based on data that best reflected the different drivers of service usage.

Extensive consultation was undertaken with key SC staff regarding the in-scope expenses and client activity, cost centre types (direct, indirect, corporate), cost allocation methodologies, account rollups, linking activity data to expense data, and costing fractions. Given the existing SC datasets were not designed to be used in an activity-based costing process, approximately 500 business rules were developed for the allocation of activity to episodes, with a further set of rules developed for allocating client activity to products.

The results of the costing study were incorporated into a formal report which included the costing methodology, results and discussion. The costing results formed the basis for the development of the casemix classification.

**Casemix classification development**

The costed episode-level dataset for the financial year 2016-17 was expanded for the classification development work. Variables that could be potential cost drivers were sourced from other collections and added to the dataset, including diagnoses and other client clinical information.

The collection of much of the clinical information by SC is determined by the requirements of particular contracts, with a number of different data collection tools used. As a result there were inconsistencies across the newly created dataset, both in terms of data definitions and in the format in which data were collected.

Decisions were made regarding the clinical data that could be used for the classification development based on relevance to care cost and coverage across the dataset. A significant amount a work was undertaken to maximise the data that could be used, including developing mappings between the data items in the different clinical collections and aggregating diagnoses and health groups to higher level categories. Time-based rules were also developed to determine whether clinical information was current and relevant for a given episode.

In classification development analysis it is important to only include completed episodes of care. This ensures that the ‘units of counting’ contain complete information and are fully representative of the service provided within a product. For this dataset, complete episodes were identified as those that either started and ended within the financial year 2016-17, or started prior to the beginning and continued after the end of the financial year. Incomplete episodes were those that ‘straddled’ the start or end of the year, and these were excluded from the class finding analysis.

While the dataset was constructed to include data that were as consistent and complete as possible, there were inevitably many gaps, given the analysis was being done retrospectively on data that had been collected by SC for a different purpose.

**Class finding**

The development of the classification involved both statistical analysis and clinical consultation. This ensured that the classification was both statistically robust and clinically meaningful. A panel of clinical experts from across SC was consulted throughout the process.

The class finding decisions were guided by a set of underlying principles, including that the episodes within a class should be as homogeneous as possible and
that the classes should be both clinically meaningful and as different from each other as possible in terms of resource use. A statistical regression methodology was used to identify and test the variables in the data that best explained the variability in resource consumption within different groups. The coefficient of variation (CV) for cost, a statistical measure of homogeneity, was used to evaluate potential classes, with a CV of <100 considered a good outcome.

The options for assigning the episodes into different classes within each of the products were presented to the clinical expert panel for their input throughout the iterative development process.

**Results**

The final draft classification has 47 classes across 16 products, including one ‘ungroupable’ class for episodes where variables required for grouping were missing. Patient clinical or demographic characteristics were preferred as class splitting variables in order to create a classification that was clinically meaningful. The selected variables also needed to be present across enough episodes within a product to avoid a large number ending up in the ‘ungroupable’ class. Where suitable clinical and demographic variables were not generally available for a product, proxies such as the length of the episode or whether an episode was ‘compound’ were used.

In addition to the minimum dataset for Version 1 of the classification, other data variables that had been flagged as potential cost drivers but were not available for analysis were recommended for inclusion in the data collections. These can then be tested in future refinements of the classification.

A casemix reporting suite was developed by NCCC based on feedback from key SC staff about the information that would be most useful for them in managing their services. An interactive casemix analytics course was also delivered, providing key staff with the tools for analysis, including simple statistical techniques, to enable better clinical and management information to be generated from the SC data.

**Outcomes and challenges**

Implementing a casemix-based management system into SC represents a significant change in how SC are able to describe, analyse and manage services. The ability to understand the costs and resources required to deliver care will assist SC in meeting the challenges of service sustainability, efficiency and effectiveness.

There were many challenges in undertaking the technical aspects of this project, including; the application of activity-based costing methods in a non-hospital financial environment; generating a classification dataset from various data collections across SC that were not intended for this purpose; developing and applying a definition for an episode of care and the products; and dealing with missing and inconsistent data in the development of the classification.

As highlighted in Phase 1 of the project, the system will require ongoing development following implementation. However, the foundations are now in place, and the benefits of casemix-based management will be realised as SC incorporates the system into their organisation and builds local skills and expertise into the future.

**Phase 3 – Taking the lead**

Phase 3 of the project involved providing recommendations for the ongoing systems refinement, planning for the longer term priority issues, and building the capacity for casemix-based management within SC.
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