Care Pathways and Packages Project

Developing currencies for mental health payment by results

Cluster Development Story

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Summary of the development of care clusters for mental health payment by results

Introduction

The Care Pathways and Packages Project (CPPP) was established in 2007 following a request by the Department of Health (DH) for service engagement in supporting the development of Payment by Results (PbR) for mental health (MH) services. Providers and commissioners, across Yorkshire and the North East, came together with a common aim to influence this initiative, hoping to ensure that the resulting model encouraged the correct incentives.

“Care clusters” provide the framework for the MH PbR model and they have been established over a number of years in several stages. These stages of development have been described in previous reports that are available via the DH or CPPP websites. This report provides a description of cluster evolvement, including initial inception to national mandating, in one brief reference.

Developmental journey

The development path for the mental health care clusters commenced in 2001. Starting as a local initiative to improve care provision, the process has involved a number of iterations leading to the 21 care clusters that have been mandated for use as part of a National Mental Health Payment by Results system (Appendix 1). The stages of development have been described in detail elsewhere and references are provided for those requiring further information.

A visual representation of these stages is provided in figure one to illustrate how clusters evolved from 10 statistically generated groups to the 21 needs-based clusters that apply across working age and older adults.

Each stage will be outlined in the following sections and is summarised in table one.

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</tr>
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Figure 1: Visual representation of cluster development

<table>
<thead>
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<th>Stages</th>
<th>Original Data Block</th>
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<tr>
<td>Stage 1</td>
<td>A B C D E F G H I J</td>
</tr>
<tr>
<td>Stages 1 and 2</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13</td>
</tr>
<tr>
<td>Stage 4</td>
<td>1a 1b 2a 2b 3 4a 4b 5 6 7 8a 8b 9 10 11 12 13</td>
</tr>
<tr>
<td>Stage 5</td>
<td>1a 1b 2a 2b 3 4a 4b 5 6 7 8a 8b 9 10 11 12 13 14 15 16a 16b</td>
</tr>
<tr>
<td>Stage 6</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21</td>
</tr>
<tr>
<td>Stages 7 and 8</td>
<td>0 1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 17 18 19 20 21</td>
</tr>
</tbody>
</table>
The care clusters were originally developed as part of the Integrated Packages Approach to Care (InPAC) programme in South West Yorkshire Partnership NHS Foundation Trust. Self et al., (2008) outlined these first two stages and therefore provided the underpinning evidence for the care cluster approach. These stages utilised a statistical process known as cluster analysis to discover groups of service users with similar needs based on scores on a tool derived from the Health of the Nation Outcomes Scales (HoNOS) (Wing et al., 1999) that has become known as the Mental Health Clustering Tool (MHCT). Cluster analytic methods are purely empirical and can be insensitive to differences between service users that are clinically but not statistically meaningful (Blashfield, 1980). For this reason, a panel of 18 senior clinicians reviewed data gathered in stage one to ensure the clinical validity of statistically derived groups (Screbnik et al., 1998; Uehara et al., 1994). The panel represented psychiatrists, psychologists, nurses, social workers, occupational therapists and dieticians in the organisation.

Next, the multidisciplinary panel sought to improve the homogeneity of membership. For example, a large statistically generated ‘simple non-psychotic’ group which contained people with scores on the depression and other mental health problems items was sub-divided into three groups representing ‘mild’, ‘moderate’ and ‘severe’ problems. However not all groups could be made homogenous based on MHCT scores alone. Service users presenting with relatively minor non-psychotic common mental health problems scored similarly to those with managed long-term problems associated with psychosis. In order to separate these groups, “super classes” were introduced which first differentiated service users based on whether their presenting needs were psychotic or non-psychotic. The process generated 13 clinically meaningful clusters. Although clusters are not based on diagnosis, the introduction of super classes at this stage meant that clusters group according to broad diagnostic categories.

The next step was to develop membership criteria. Although a profile of scores (mean scores for each MHCT item) was determined for each cluster, detailed examination showed that for some items the mean score described a central attribute of the cluster with all members scoring the same whilst other items were much more variable. Membership criteria were achieved by determining which items were core to cluster membership (and therefore to the core care plan) and which items were likely to be important but more variable in the members (and therefore related to optional or additional care plan items). Other items were seen as not relevant to cluster membership with variations in these seen as random variances that would require a care plan response specific to the individual. Defining MHCT items in this way ensured that the clusters were useful in practice i.e. only some scores were essential in defining cluster membership by clearly identifying those attributes that all members would share. In summary, MHCT item scores were identified and defined for each cluster. Some items were defined by a single score acceptable to membership while others had a range of acceptable scores. These scores were then categorised as: Must have; Likely to have; May have; Not likely to have or Must not have.

In order to validate the clinical changes, the project leader and research assistant returned to the data to find out if the clinicians’ descriptions of the service users in each cluster were supported by the information from the data collection exercise.
Cases were selected according to the MHCT score and in this way, 85% of clients were allocated to one of the 13 clusters. There was some overlap between the clusters. Fifteen percent of the allocated clients fit the criteria for more than one group. However, this was felt to be an acceptably low proportion at this early stage.

The current Mental Health Clustering Booklet 2013/14 v3.0 (DH 2013) has been developed using this methodology of combining empirical evidence with clinical expertise over several iterations. The booklet contains a set of clusters that have colour coded the membership criteria to make it more user friendly.

**Stage 3: Testing generalisability (13)**

It was the ability of the cluster methodology to classify service users into groups, based on the similarity of their needs and characteristics, (with correspondingly similar packages of care) that made care clusters attractive as a potential currency for mental health services. As a result, in stage three, the clusters were tested for generalisability by the CPPP Consortium. This phase of work demonstrated that the model was generalisable, i.e. it was applicable and had utility, across six mental health trusts in the North East and the Yorkshire and Humber regions. Ninety-seven percent of service users were allocated to a cluster and the cluster profiles matched those in the original development study. The model continued to demonstrate face and clinical validity and that clusters distinguish between groups of service users appropriately. A report was published on the DH website outlining this phase of development and the evidence provided was deemed appropriate to move forward into the next phase (DH, 2007).

The NHS information centre also produced a report analysing the Mental Health Minimum DataSet (MHMDS) to explore a more traditional Health Benefit Group approach for MH PbR (The Information Centre, 2006). The main finding was that setting was the most important factor in determining the cost of care. As a desirable property of currencies is setting independence, the clinical validity and setting independence of the clusters became a persuasive reason for the recommendation to continue to test the clusters as the approach for MH PbR. The pilot phase of CPPP had therefore replicated the original clinical review of clusters, concluded that they were generalisable, clinically valid, and represented stable and discrete categories. The recommendation for the next phase of work was to refine this model for national use and test whether care packages could be developed based on the clusters.

**Stage 4: Refinement and alignment to other frameworks (17)**

A clinical development group (CDG) was established at this stage to ensure that all aspects of model development within the CPPP were clinically driven and in keeping with the ethos of the approach. The original methodology of an iterative process involving review of data by clinicians was utilised to inform decisions. Clinical review supported by basic statistical checks led to the division of three of the 13 clusters to make them more homogenous (i.e. more alike) and more in line with clinical guidance. Therefore, in 2007, Clusters 1 and 2 were split into 1a, 1b, 2a and 2b to align with the NICE stepped care model more effectively. Cluster 4 was also split into 4a and 4b to represent “active” and “chronic” versions of disorders of over-valued ideas. The clinical review and large dataset available to the CPPP Consortium also indicated that cluster 8 required subdividing to reduce heterogeneity. A detailed report of this process was not produced but the outputs were collated in a revised version of the MHCT.
Stage 5: Addition of organic/ cognitive impairment clusters (21)

The original 13 clusters that were developed within the working age adult service were reviewed by a large multi-agency working group and the group accepted the original 13 clusters as applicable to older people. Older people were felt to have similar mental disorders to younger adults with some needs tending to increase with age, e.g. cognitive and physical problems, vulnerability and possibly relationship issues.

Four clusters covering organic presentations were developed via clinical consensus and review of NICE guidance and an organic super class was added to the cluster model. Purely based on clinical expertise, membership criteria on each of the assessment tool item were generated.

Although there was a lot of face and clinical validity to the approach taken to develop the cognitive impairment clusters, they were not developed using statistical techniques in the same way as the original 13 clusters. Although no published reports are available, this development was subsequently reviewed by the National Dementia Lead and attendees at a dementia commission conference in 2009, who confirmed that they were aligned to the National Dementia strategy (DH, 2009). At this stage, the four additional clusters and the organic super class were recommended to be incorporated into the existing model. The organic clusters have since been tested empirically and were seen to show robust properties (Self and Painter, 2009).

This phase of development also included development and initial costing of care packages that further demonstrated the potential for care clusters as a PbR currency. The ability to cost care packages was demonstrated and the pattern of the relative costs when clusters were compared to one another was similar across organisations but resource homogeneity was not investigated at this stage.

Stage 6: Demonstrating structural properties and algorithm development (21)

There were now 21 care clusters. From this stage on, the Cluster work stream of the CPPP was charged with providing evidence to help validate the use of the 21 needs-based clusters as the primary currency unit within the developing national Mental Health PbR system. The use of any single traditional validation criteria was generally accepted to be inappropriate given the novel approach to MH PbR now being taken. As a result, a set of criteria were proposed by Self, Painter & Davies (2008) as more suited to the evaluation of a mental health PbR classification system and these became the guiding principles. Broadly based on Bowker and Star’s (2000) views as to what makes a good, fit for purpose, classification system, these can be summarised as:
The diverse nature of these criteria ultimately required the collation and synthesis of evidence from all other areas of the project (most notably the Costing/Currency Group). The outputs for this stage of development were described in detail in Self and Painter (2009), a report that is available on the CPPP website. The report links cluster development to fuzzy logic and proportional membership approaches which were being explored as a suitable empirical framework for the cluster approach. In statistics, the properties of membership describe both the necessary and sufficient conditions for membership. However, in the real world, necessary and sufficient conditions are very rarely met and categories tend to be ‘fuzzy’ at their boundaries. Therefore, very few people in each group will be exactly the same as one another and will at times overlap with people in other groups.

Self and Painter (2009) provided a detailed description of the development of a proportional membership algorithm by combining statistical and clinical approaches. The study demonstrated that it was possible to develop “weighted archetypal clusters” that ensure the uniqueness of clusters while maximising cluster membership. The report was published and made available to the DH prior to the mandation of the care clusters as PbR currencies and provided part of the evidence required for the Information Standards Board (ISB) approval. The development of a proportional membership model presented an opportunity to formally test the clusters in a more sophisticated way and ensure that they represented a fit for purpose classification system. The extent to which this was achieved was limited by data quality but effectively moved development forward.

This phase of development also included further testing of the needs assessment tool and cluster allocations over a wider geographical area as part of a DH driven process to mandate a national tool (DH, 2010). In 2009, formal piloting of two proposed versions of the MHCT was carried out by the CPPP and the London mental health currency development programme. Criteria were set to test cluster allocation, inter-rater reliability and ease of use (TIC, 2009). Based on these findings, the Mental Health PbR Product Review Group (PRG) (a multi-disciplinary, decision-making group that makes recommendations to the PbR Project Board) recommended that if a tool was to be agreed for national use, it should include the original HoNOS as one element due to the wider benefits of incorporating an internationally established outcome measure within the PbR system. Although the inter-rater reliability criterion had not been met for this version, the PRG were satisfied that due to the developmental nature of the work, performance could be improved, and that one agreed tool would help provide a consistent basis for this work.
Before the clusters were mandated for national use, they were renumbered to remove the alphanumeric labels. Thereby, allowing further subdivisions in the future if required.

An additional “variance” cluster 0, was also incorporated for people whose needs would not be met by any of the other clusters but who do need a mental health service. Initially there were some concerns that this would be overused. However, it has been found to represent only 2.5% of allocations indicating its need and appropriate use in practice (CPPP internal data report, 2013). Certain mental health needs are not currently included within the other 20 clusters; therefore, the variance cluster and its use can be explored to inform future developments.

A study was also conducted at this stage to test whether cluster 9 (Substance misuse) was a unique cluster or represented a co-morbidity of other clusters. The findings of this can be found in (Self and Painter, 2009) and demonstrated that cluster 9 contained diverse groups of patients with a range of MH and substance misuse problems that could be accurately reallocated into one of the other non-psychotic clusters. It was recommended that this cluster should be removed to ensure this diverse group received appropriate care and it has been replaced by a blank place marker for further development.

At this stage of development of the national Mental Health Clustering booklet, a set of care transition protocols for each cluster were introduced in order to ensure patients moved appropriately between clusters that genuinely described their needs (rather than being re-allocated on the basis of a brief and potentially misleading rating period). As scores on the MHCT are only used to allocate a patient at first referral, Care Transition Protocols (CTPs) were designed in order to systematically reflect a simplified but quantifiable set of clinical decisions. In essence, they are intended to provide more consistency when deciding whether to allocate the patient to a different cluster at a subsequent clinical review (the exit criteria). The CTPs for each cluster include:

- Its relationship to other clusters
- The likelihood of each cluster transition occurring
- Step up criteria
- Step down criteria
- Examples of local discharge criteria
- Maximum review intervals
- Anticipated episode durations

When the 2010/11 Clustering Booklet was first published by the DH, no longitudinal data was available to validate the CTPs that had been generated by clinicians. As a result, the clusters and the clustering tool were effectively mandated and ratified by the ISB whilst the CTPs were not. The decision to include these protocols in the booklet was therefore taken by DH in order to provide a clinically coherent model and a clear direction for future developments.
Stage 8: Development of a national algorithm (21)

Following the national mandating of the care clusters, the focus of national work shifted to implementation of PbR. Therefore, the remit for the CPPP Consortium also shifted from development to implementation in stage 8. The cluster validation work stream focused on the development of a national algorithm as this was a key deliverable for the DH. A robust algorithm to facilitate and support clinical cluster allocation would not be possible if the clusters themselves did not possess the appropriate properties.

To provide decision-support for clinicians at the point of cluster allocation, the DH and the CPPP Consortium commissioned a piece of statistical analysis to produce an algorithm that describes (at the first clustering assessment) how well any combination of MHCT scores fit each viable cluster. An algorithm is now available in excel-format for use by any organisation that is willing and able to do so. A version is also available via the CPPP website (www.cpppconsortium.nhs.uk) that allows clinicians to enter sets of scores and see the likelihood of cluster membership. This provides a useful road-testing phase allowing further feedback to be gathered from organisations using the algorithm in practice and informing any future developments.

The development of this algorithm was described in Painter and Nowak (2012) and it incorporated three phases from feasibility testing to cross validation on a national sample. Initial analysis indicated that the clusters demonstrated robust properties that made the creation of an algorithm viable. This is significant as the clusters were not created through statistical methods alone, and the revisions made to ensure the clusters were also clinically meaningful could have adversely affected the model’s statistical properties.

The initial algorithm was then refined and cross-validated on national data. Although retrospective use of the algorithm is not its primary purpose, it was also important to understand how the proposed algorithm performed on other blocks of data. Despite some weaknesses in using data of variable quality from Q1, 2 and 3 2011/12 the MHMDS data held by the Information Centre (IC) was an obvious source of large volumes of multi-provider data. The analysis undertaken by the DH on MHMDS data and the findings was described in Painter and Nowak (2012).

2013/14

The CPPP set out to test and provide evidence for care clusters as a currency for mental health PbR and this developmental journey has been briefly described. These clusters are now mandated for working age and older adult services and the applicability of the cluster approach is being explored in learning disabilities (LD) and secure services. CPPP are leading a pilot project to create a seamless continuation of the adult and working age clusters within LD services, utilising the original methodology of cluster analysis and clinical review. It is anticipated that the continued development of these clusters will help inform the future direction of Learning Disabilities PbR nationally.

CPPP have also worked closely with the Improving Access to Psychological Therapies (IAPT) team who have now taken on board use of the full MHCT as clusters were found to be linked to complexity and therefore useful in their developing currency model.

CPPP are also leading the national work to develop a quality and outcomes framework to support MH PbR.

Supporting the implementation phase, the Costing group has placed increasing emphasis on costing periods of care by cluster rather than costs per day, as a more robust basis for the developing currency model. This will also be linked to the quality and outcomes work that is looking to establish a range of measures (quality indicators, outcomes and experience measures) that will be built around the clusters as the overall currency model.
Data quality has been identified as a key area requiring improvement throughout the development process and this remains an issue. Support is required for the national data collection system to support this improvement and it is important that clinicians remain engaged with this clinically driven process. Developing and implementing a MH PbR system is challenging and CPPP remains committed to this ongoing process.

References


The Information Centre (2009) Mental Health Payment by Results: Ease of Use Survey Results.

National Institute of Clinical Excellence – NICE (October 2009) Practice Guideline 90. *Depression: The Treatment and Management of Depression in Adults (Update).*


Self, R. and Painter, J. (2009) Study to improve and demonstrate the structural properties of the care clusters that form the basis of the PbR currency develop programme. Care Pathways and Packages Project.


**APPENDIX ONE: The 21 care clusters**

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>Variance</td>
</tr>
<tr>
<td>1</td>
<td>Common Mental Health Problems (Low Severity)</td>
</tr>
<tr>
<td>2</td>
<td>Common Mental Health problems (Low Severity with Greater Need)</td>
</tr>
<tr>
<td>3</td>
<td>Non-Psychotic (Moderate Severity)</td>
</tr>
<tr>
<td>4</td>
<td>Non-Psychotic (Severe)</td>
</tr>
<tr>
<td>5</td>
<td>Non-Psychotic (Very Severe)</td>
</tr>
<tr>
<td>6</td>
<td>Non-Psychotic Disorders of Overvalued Ideas</td>
</tr>
<tr>
<td>7</td>
<td>Enduring Non-Psychotic Disorders (High Disability)</td>
</tr>
<tr>
<td>8</td>
<td>Non-Psychotic Chaotic and Challenging Disorders</td>
</tr>
<tr>
<td>9</td>
<td>Blank</td>
</tr>
<tr>
<td>10</td>
<td>First Episode in Psychosis</td>
</tr>
<tr>
<td>11</td>
<td>Ongoing Recurrent Psychosis (Low Symptoms)</td>
</tr>
<tr>
<td>12</td>
<td>Ongoing or Recurrent Psychosis (High Disability)</td>
</tr>
<tr>
<td>13</td>
<td>Ongoing or Recurrent Psychosis (High Symptom and Disability)</td>
</tr>
<tr>
<td>14</td>
<td>Psychotic Crisis</td>
</tr>
<tr>
<td>15</td>
<td>Severe Psychotic Depression</td>
</tr>
<tr>
<td>16</td>
<td>Psychosis and Affective Disorder (high substance misuse and engagement)</td>
</tr>
<tr>
<td>17</td>
<td>Psychosis and Affective Disorder Difficult to Engage</td>
</tr>
<tr>
<td>18</td>
<td>Cognitive Impairment (Low need)</td>
</tr>
<tr>
<td>19</td>
<td>Cognitive Impairment or dementia Complicated (Moderate Need)</td>
</tr>
<tr>
<td>20</td>
<td>Cognitive Impairment or dementia Complicated (High need)</td>
</tr>
<tr>
<td>21</td>
<td>Cognitive Impairment or dementia Complicated</td>
</tr>
<tr>
<td></td>
<td>(High physical or engagement needs)</td>
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</tbody>
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Timeline of cluster development

1. Statistical generated groups
2. Clinical review of statistically generated groups
3. Testing generalisability of clusters
4. Refinement and alignment to other frameworks
5. Addition of organic/cognitive impairment clusters
6. Demonstrating structural properties and algorithm development
7. First set of national clusters: Renumbering
8. Development of a national algorithm
9. Extending the scope and implementation

1. 2001
2. 2006
3. 2007
4. 2008-2009
5. 2010
6. 2011
7. 2012-2013

Number of clusters:
- 10
- 13
- 13
- 17
- 21
- 21
- 21
- 21
- 2013

Ease of Use and Inter-rater reliability
Costing packages of care linked to clusters
Cluster 9 removed
Care transition protocols
Routine data submissions of acceptable quality required

Milestones:
- Cluster methodology developed in SWYMHT
- CPPPP consortium formed
- DH made Clusters available for national use
- DH mandated Clusters
- DH made Clusters available for national use
- Routine data submissions of acceptable quality required