

# Comparing the BDA Case Mix Tool and Simplified Case Mix Tool for stratification of public dental patients with disability in South Australia

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# Abstract

## ***Introduction:***

All individuals have a right to equal access to oral healthcare. Finding a dental practitioner experienced in managing individuals with special needs, is a commonly reported barrier to accessing oral healthcare for people with disabilities.

## ***Aim:***

The aim of this study was to determine the applicability of the British Dental Association Case Mix Tool and the simplified Case Mix Tool for the Australian context.

## ***Methods:***

A retrospective analysis of 131 dental records for patients on recall at the Special Needs Unit, Adelaide Dental Hospital compared the specialist-performed complexity stratification with results obtained using the British Dental Association case mix tool and simplified case mix tool by a general dentist.

## ***Results:***

The British Dental Association case mix tool demonstrated substantial agreement with the specialist-performed complexity stratification and had a higher reliability than the simplified case mix tool.

## ***Conclusions:***

The British Dental Association case mix tool may be suitable for use in the Australian context by general dental practitioners, to identify the level of complexity of an individual with special needs, so as to ensure their oral healthcare needs are matched to a dental practitioner with the required skills and experience.

## **Key Points (“in Brief”)**

- Demonstrates British Dental Association (BDA) Case Mix Tool (CMT) and simplified Case Mix tool (sCMT) are able to replicate the patient complexity stratification performed by a very experienced specialist in Special Needs Dentistry in South Australia with moderate to substantial agreement
- Highlights the suitability of the BDA CMT application in a Hub and Spoke Model oral healthcare system to enable oral healthcare provision by an appropriately experienced dental practitioner to identify complexity of patients with disability requiring dental care
- Findings suggest that the BDA CMT and sCMT are useful stratification tools which can be used by community-based general dentists to identify the complexity of patients requiring dental care

## **Introduction:**

Special needs dentistry (SND) aims to address the oral health needs of people with disability, medical, physical, or psychiatric conditions, that require specialised methods, techniques, and treatment plans to prevent or treat oral health issues, due to oral health being compromised directly through the condition itself, or indirectly through medication or poor access to care.<sup>1</sup>

Difficulties accessing oral healthcare services has been established as a predictor of poorer oral health measures in people with disability.<sup>2</sup> The population with disability face a number of barriers to accessing oral healthcare services, including

lack of physical accessibility to oral healthcare facilities within their local communities, and difficulty accessing oral healthcare professionals trained in Special Needs Dentistry.<sup>3,4</sup> The limited specialist workforce cannot address all of the current barrier issues, and therefore, there is a need for other dentists to assist in managing the population with special needs.

A wide range of conditions cause disability, with differing levels of medical, cognitive and physical impairments. Only 5.7% of Australians experience profound or severe disability<sup>5</sup>, the majority have disabilities that are minor or moderate and would benefit from accessing mainstream public dental services within the community by an experienced general dentist with increased knowledge in the management of individuals with special needs.

In July 2014, the Special Needs Dentistry Network was established in the SA Dental Service to improve access to oral healthcare for individuals with special needs. Experienced general dentists from key public community dental clinics distributed in metropolitan and rural South Australia (SA) were upskilled to provide oral healthcare for individuals with special needs. This “Hub and Spoke” model is similar to the structure to the National Health Services (NHS) in the United Kingdom<sup>6</sup>, with the “Special Needs Dentistry Network” providing an integrated care pathway between community-based general dentists and the registered SND specialists, post-graduate SND trainees, and SND experienced general dentists in Special Needs Unit, Adelaide Dental Hospital. This enabled SND Network dentists to be a point of referral:

1. from less experienced community based general dentists to enable assessment and provision of oral healthcare for individuals with special needs, who may be too complex for them to manage, but whom may not require the input of a specialist in special needs dentistry
2. to specialists in SND for provision of dentistry for individuals with special needs beyond their expertise, or who require access to behavioural or physical supports including wheelchair platforms, oral sedation, general anaesthesia, and
3. from specialists in SND for provision of maintenance or preventative care for patients with special needs whose immediate oral healthcare needs have been stabilised.

The use of a validated tool which could be used by community based general dentists to stratify patient-complexity in an objective and reproducible method, equivalent to that performed by an experienced SND specialist, had the potential to ensure that patient complexity was matched with the SND skill set of the dentist, thereby reducing the number of individuals with mild SND complexity being referred to the Special Needs Unit, reducing specialist waiting list times, as well as travelling time and associated financial costs for patients.<sup>7</sup>

The British Dental Association case mix tool (BDA CMT) and simplified case mix tool (sCMT) are assessment tools designed to measure patients’ complexity. Both were selected for investigation in this study due to their high applicability for implementation within the SA Dental Service, given the oral healthcare delivery model resembling the NHS, where the BDA CMT and sCMT have been widely implemented.

The BDA CMT consists of a structured matrix with six parameters relating to patient-related complexities that measure its effect on oral healthcare provision.<sup>8</sup>

The six parameters are as follows:

1. Ability to communicate
2. Ability to cooperate
3. Medical status
4. Oral risk factors
5. Access to oral care
6. Legal and ethical barriers

Each parameter contains a detailed narrative to assist in assigning a complexity score. Table 1 demonstrates the narrative for the ability to cooperate parameter. The scoring is measured on a four-point scale with zero representing no barrier or complexity for that parameter and A, B, and C representing increasing levels of complexity.<sup>8</sup>

Table 1  
BDA CMT narrative and complexity score scale for ability to cooperate<sup>6</sup>

| <i>Complexity score</i> | <i>Narrative</i>  |
|-------------------------|---|
| 0                       | 0 Patient will accept all restorative care and simple extractions with local anaesthesia +/- standard behavioural management techniques                 |
| A                       | 3 Full examination and/or simple treatment possible, but requiring additional support or behaviour management techniques                                |
| B                       | 6 Limited examination only possible<br>Clinical holding required<br>Patient will accept limited restorative care of anterior teeth only with difficulty |
| C                       | 12 Patient requires general anaesthesia, sedation or other advanced management techniques to accept treatment   |

The data from the BDA CMT can be analysed based on the sum of all the weighted scores across all six criteria which is then assigned to a band shown in Table 2.

Table 2  
BDA CMT data analysis: banded total score method<sup>13</sup>

| <i>Total score</i> | <i>Complexity band</i> |
|--------------------|------------------------|
| 0                  | Standard patient       |
| 1–9                | Some complexity        |
| 10–19              | Moderate complexity    |
| 20–29              | Severe complexity      |
| 30 +               | Extreme complexity     |

The simplified case mix tool was developed following psychometric investigation conducted by Duane et al<sup>9</sup> where the oral factors parameter was omitted as it did not add to reliability, score weighting was removed and complexity was collapsed into a three-point scale to allow more efficient use.

This study to explores the potential applicability of both the BDA CMT and the sCMT for individuals with Special Needs, who are eligible to access oral healthcare through public dental clinics in South Australia.

## Materials And Methods:

Ethics approval was obtained from the Central Adelaide Local Health Network Human Research Ethics Committee and the Human Research Ethics Committee of the University of Adelaide.

In August 2016, a specialist-performed stratification of 918 individuals with disability who were on recall in Special Needs Unit, Adelaide Dental Hospital was conducted. Patients were stratified into three complexity groups,

- patients with severe complexity who would remain under the care of a specialist in SND;
- patients with moderate complexity who would remain in in the Special Needs Unit, but under the care of a dentist experienced in SND, and
- patients with mild complexity who were referred to community-based SND Network dentists.

The target sample for this retrospective analysis was drawn from the above recall list. 150 patients were selected, with 50 patients derived from each of the three categories above. The principal investigator applied the inclusion and exclusion criteria, with a final sample of 131 patient records.

The inclusion criteria included patients with a disability referred to the Special Needs Unit and on the recall list from August 2016, and who had subsequently attended an appointment with either a SND Network dentist in the Community Dental Service or to a dentist experienced in providing SND in the Special Needs Unit.

A total of 19 participants were excluded. Participants were excluded from analysis if they were deceased (2), had more than one criteria rated as 0 due to insufficient information in clinical records (13), if there was no medical history record completed within the last two years (2) and because they had attended an appointment with the principal investigator previously (2).

The data extraction was completed by the principal investigator, who had been registered as a general dentist for five years, through accessing hard copy casenotes and electronic dental records of the selected patient sample. Sources for data extraction included previous dental treatment history, medical history, as well as incoming and outgoing referral documents. Each dental record was assessed using the BDA CMT and sCMT and assigned scores for each parameter and a total score for each participant. Where there was no recorded information regarding a parameter, it was assumed that it was not a concern for the individual and assigned a value of "0".

Table 3 provides an overview for BDA CMT criteria score weightings.

Table 3  
BDA CMT criteria score weightings<sup>13</sup>

| <b>Criteria</b>            | <b>0</b> | <b>A</b> | <b>B</b> | <b>C</b> |
|----------------------------|----------|----------|----------|----------|
| Ability to communicate     | 0        | 2        | 4        | 8        |
| Ability to cooperate       | 0        | 3        | 6        | 12       |
| Medical status             | 0        | 2        | 6        | 12       |
| Oral risk factors          | 0        | 3        | 6        | 12       |
| Access to oral care        | 0        | 2        | 4        | 8        |
| Legal and ethical barriers | 0        | 2        | 4        | 8        |

To enable comparison of sCMT complexity assessments to the BDA CMT, scores were assigned to the sCMT letters, with 0 and A remaining as the same value as the BDA CMT, and B/C in the sCMT assigned the average of B and C values for the BDA CMT. The assigned scores are outlined in Table 4.

Table 4  
Scores assigned to sCMT letters for statistical analysis

| <i>Category</i>            | <i>Complexity score</i> | <i>Assigned score</i> |
|----------------------------|-------------------------|-----------------------|
| Ability to communicate     | 0                       | 0                     |
|                            | A                       | 2                     |
|                            | B/C                     | 6                     |
| Ability to cooperate       | 0                       | 0                     |
|                            | A                       | 3                     |
|                            | B/C                     | 9                     |
| Medical status             | 0                       | 0                     |
|                            | A                       | 2                     |
|                            | B/C                     | 9                     |
| Access to oral care        | 0                       | 0                     |
|                            | A                       | 2                     |
|                            | B/C                     | 6                     |
| Legal and ethical barriers | 0                       | 0                     |
|                            | A                       | 2                     |
|                            | B/C                     | 6                     |

Additional data collected included demographic data on age, gender, location, type of disability and treating dentist (SND specialist/Special Needs Unit dentist/SND Network dentist). The number and percentage of patients who were subsequently referred to a different dentist (SND specialist/Special Needs Unit dentist/SND Network dentist), were also determined in order to assess the accuracy of the subjective, specialist-performed stratification.

## Results:

Of the 131 dental records analysed there was a largely even distribution of participants from each of the three complexity categories, with 44 (34%) in the SND specialist group, 45 (34%) in the Special Needs Unit dentist group, and 42 (32%) in the Special Needs Dentistry Network dentist group. The majority of the study participants resided in the South Australian metropolitan area, 108 (82%) compared to 23 (18%) who resided in a rural area. There was a relatively equal gender distribution, with 60 females (46%) and 71 males (54%). The age distribution of the participants is outlined in Table 5. The average age of the participant group was 46.4 years with a standard deviation of 13.6 years.

Table 5  
Age distribution of the participants in the retrospective study

| <i>Age group (years)</i> | <i>Frequency</i> | <i>Percentage</i> |
|--------------------------|------------------|-------------------|
| < 36                     | 30               | 22.9              |
| 36–46                    | 35               | 26.7              |
| 47–54                    | 31               | 23.7              |
| 55+                      | 35               | 26.7              |
| <b>Total</b>             | <b>131</b>       | <b>100</b>        |

Most the study participants had an intellectual disability (ID) at 102 (78%), followed by physical disability (PD) at 50 (38%), and psychiatric disability (PsychD) at (30) 23%. The frequency of participants with more than one type of disability is also demonstrated, with 36 (27%) of participants with both intellectual disability and physical disability, 13 (10%) with intellectual disability and psychiatric disability, 5 (4%) with both psychiatric and physical disability, and 2 (2%) with all three types of disability.

Table 6 illustrates the frequency and percentage of the nature of the participant's disability.

Table 6  
Frequency and percentage of participant's type of disability

| <i>Type of disability</i>                          | <i>Frequency</i> | <i>Percentage</i> |
|--|------------------|-------------------|
| Intellectual disability (ID)                       | 102              | 78                |
| Physical disability (PD)                           | 50               | 38                |
| Intellectual disability and physical disability    | 36               | 27                |
| Psychiatric disability (PsychD)                    | 30               | 23                |
| Intellectual disability and psychiatric disability | 13               | 10                |
| Psychiatric and physical disability                | 5                | 4                 |
| Intellectual, physical and psychiatric disability  | 2                | 2                 |

The British Dental Association case mix tool (BDA CMT) and simplified case mix tool (sCMT) results

The level of complexity of each participant was assessed using the BDA CMT and recorded for all six categories: communication, cooperation, medical status, access, oral risk factors, and legal and ethical barriers. The distribution of scores in each category of the BDA CMT is demonstrated in Table 7.

Table 7  
Distribution of frequency and percentages of the scores in each criteria of the  
BDA CMT

| <i>Category</i>            | <i>Complexity score</i> | <i>Frequency</i> | <i>Percentage</i> |
|----------------------------|-------------------------|------------------|-------------------|
| Communication              | 0                       | 15               | 11                |
|                            | A                       | 54               | 41                |
|                            | B                       | 62               | 47                |
|                            | C                       | 0                | 0                 |
| Cooperation                | 0                       | 29               | 22                |
|                            | A                       | 54               | 41                |
|                            | B                       | 14               | 11                |
|                            | C                       | 34               | 26                |
| Medical status             | 0                       | 119              | 91                |
|                            | A                       | 1                | 1                 |
|                            | B                       | 11               | 8                 |
|                            | C                       | 0                | 0                 |
| Access                     | 0                       | 11               | 8                 |
|                            | A                       | 102              | 78                |
|                            | B                       | 18               | 14                |
|                            | C                       | 0                | 0                 |
| Oral risk factors          | 0                       | 51               | 39                |
|                            | A                       | 40               | 31                |
|                            | B                       | 39               | 30                |
|                            | C                       | 1                | 1                 |
| Legal and ethical barriers | 0                       | 3                | 2                 |
|                            | A                       | 26               | 20                |
|                            | B                       | 99               | 76                |
|                            | C                       | 3                | 2                 |

The participant's overall complexity was calculated based on weightings using the banded total score method as outlined in Table 2. The overall complexity of the studied group measured by the BDA CMT is outlined in Table 8.

Table 8  
Distribution of the level of complexity in the studied group  
measured by the BDA CMT

| <i>Level of measured complexity</i> | <i>Frequency</i> | <i>Percentage</i> |
|-------------------------------------|------------------|-------------------|
| Standard                            | 0                | 0                 |
| Mild                                | 24               | 18                |
| Moderate                            | 61               | 47                |
| Severe                              | 41               | 31                |
| Extreme                             | 5                | 4                 |

The level of complexity of each participant was also assessed using the sCMT and recorded for all five categories: communication, cooperation, medical status, access, and legal and ethical barriers. The distribution of frequency and percentages of the scores in each category of the sCMT is demonstrated in Table 9.

Table 9  
Distribution of frequency and percentages of the scores in each criteria of the  
sCMT

| <i>Criteria</i>            | <i>Complexity score</i> | <i>Frequency</i> | <i>Percentage</i> |
|----------------------------|-------------------------|------------------|-------------------|
| Communication              | 0                       | 15               | 11                |
|                            | A                       | 54               | 41                |
|                            | B/C                     | 62               | 47                |
| Cooperation                | 0                       | 29               | 22                |
|                            | A                       | 54               | 41                |
|                            | B/C                     | 48               | 37                |
| Medical status             | 0                       | 119              | 91                |
|                            | A                       | 1                | 1                 |
|                            | B/C                     | 11               | 8                 |
| Access                     | 0                       | 11               | 8                 |
|                            | A                       | 102              | 78                |
|                            | B/C                     | 18               | 14                |
| Legal and ethical barriers | 0                       | 3                | 2                 |
|                            | A                       | 25               | 19                |
|                            | B/C                     | 103              | 79                |

The participant's overall complexity was calculated based on weighting using the banded total score method outlined in Table 2. The overall complexity of the studied group measured by the sCMT is outlined in Table 10.

Table 10

Distribution of the level of complexity in the studied group measured by the sCMT

| <i>Level of measured complexity</i> | <i>Frequency</i> | <i>Percentage</i> |
|-------------------------------------|------------------|-------------------|
| Standard (0)                        | 0                | 0                 |
| Mild (A)                            | 23               | 18                |
| Moderate/Severe (B/C)               | 108              | 82                |

## Assessment of specialist-performed stratification:

Of the 131 participants studied, only 3 participants (2.3%) stratified by the SND specialist and referred to a dental practitioner based on their complexity were subsequently re-referred to a different group. One participant assessed as having mild complexity, was referred from the SND network back to a general dentist with experience in SND in the Special Needs Unit (moderate patient complexity), with the reason for referral being the patient's limited opening creating difficulties for the provision of dental treatment.

Two participants were referred from the SND specialist group (severe patient complexity) to the SND network dentist group (mild patient complexity), not because of complexity, but because both participants recently had dental treatment completed under general anaesthesia, and as they resided in rural locations, it was more convenient for recall examinations to be conducted locally to reduce travel time.

## Reliability of BDA CMT and sCMT in replication of the specialist-performed stratification

The overall complexity band descriptors (mild, moderate, severe/extreme) based on the BDA CMT total scores and the sCMT total scores were allocated to a treating dentist group

- SND network dentist (1) for mild complexity (1),
- Special needs unit general dentist (2) for moderate complexity (2) and
- SND specialist (3) for severe/extreme complexity (3),

using two 3 by 3 paired tables (Table 11 for the BDA CMT and Table 13 for sCMT). The kappa statistics and the 95% confidence interval limits are outlined in Table 12 for the BDA CMT and Table 14 for the sCMT.

Table 11  
Kappa score for treating dentist group by band description for  
BDA CMT

| <b>Table of treating dentist group by band description</b> |                  |       |       |              |
|--|------------------|-------|-------|--------------|
| Treating dentist group                                     | Band description |       |       |              |
| <i>Frequency</i>   | 1                | 2     | 3     | <i>Total</i> |
| <i>Percent</i>   |                  |       |       |              |
| <i>Row %</i>   |                  |       |       |              |
| <i>Column %</i>  |                  |       |       |              |
| 1  | 23               | 18    | 1     | 42           |
|  | 17.56            | 13.74 | 0.76  | 32.06        |
|  | 54.76            | 42.86 | 2.38  |              |
|  | 95.83            | 29.51 | 2.17  |              |
| 2  | 1                | 35    | 9     | 45           |
|  | 0.76             | 26.72 | 6.87  | 34.35        |
|  | 2.22             | 77.78 | 20.00 |              |
|  | 4.17             | 57.38 | 19.57 |              |
| 3  | 0                | 8     | 36    | 44           |
|  | 0.00             | 6.11  | 27.48 | 33.59        |
|  | 0.00             | 18.18 | 81.82 |              |
|  | 0.00             | 13.11 | 78.26 |              |
| <i>Total</i>   | 24               | 61    | 46    | 131          |
|  | 18.32            | 46.56 | 35.11 | 100.00       |

Table 12  
Kappa statistics and 95% confidence interval limits for BDA CMT

| <b>Kappa Statistics</b> |          |                |                                |        |
|-------------------------|----------|----------------|--------------------------------|--------|
| Statistic               | Estimate | Standard Error | 95% Confidence Interval Limits |        |
| <i>Simple Kappa</i>     | 0.5742   | 0.0584         | 0.4598                         | 0.6887 |
| <i>Weighted Kappa</i>   | 0.6536   | 0.0503         | 0.5550                         | 0.7522 |

Table 13  
Kappa score for treating dentist group by band description for sCMT

| <b>Table of Treating dentist group by Band description</b> |                  |       |       |              |
|--|------------------|-------|-------|--------------|
| Treating dentist group                                     | Band description |       |       |              |
| <i>Frequency</i>   | 1                | 2     | 3     | <i>Total</i> |
| <i>Percent</i>   |                  |       |       |              |
| <i>Row %</i>   |                  |       |       |              |
| <i>Column %</i>  |                  |       |       |              |
| 1  | 18               | 22    | 2     | 42           |
|  | 13.74            | 16.79 | 1.53  | 32.06        |
|  | 42.86            | 52.38 | 4.76  |              |
|  | 78.26            | 38.60 | 3.92  |              |
| 2  | 5                | 26    | 14    | 45           |
|  | 3.82             | 19.85 | 10.69 | 34.35        |
|  | 11.11            | 57.78 | 31.11 |              |
|  | 21.74            | 45.61 | 27.45 |              |
| 3  | 0                | 9     | 35    | 44           |
|  | 0.00             | 6.87  | 26.72 | 33.59        |
|  | 0.00             | 20.45 | 79.55 |              |
|  | 0.00             | 15.79 | 68.63 |              |
| <i>Total</i>   | 23               | 57    | 51    | 131          |
|  | 17.56            | 43.51 | 38.93 | 100.00       |

Table 14  
Kappa statistics and 95% confidence interval limits for sCMT

| <b>Kappa Statistics</b> |                 |                       |                                       |        |
|-------------------------|-----------------|-----------------------|---------------------------------------|--------|
| <b>Statistic</b>        | <b>Estimate</b> | <b>Standard Error</b> | <b>95% Confidence Interval Limits</b> |        |
| <i>Simple Kappa</i>     | 0.4017          | 0.0633                | 0.2776                                | 0.5259 |
| <i>Weighted Kappa</i>   | 0.5135          | 0.0555                | 0.4048                                | 0.6222 |

Fleiss' kappa was used to calculate the reliability of each score in allocating patients to the same treating dentist group as the specialist-performed stratification. Table 15 outlines the interpretation of Fleiss' kappa by Landis and Koch.

Table 15

Interpretation of Fleiss' kappa<sup>10, 11</sup>

| <i>Kappa score</i> | <i>Interpretation</i>    |
|--------------------|--------------------------|
| <0                 | Poor agreement           |
| 0.01-0.20          | Slight agreement         |
| 0.21-0.40          | Fair agreement           |
| 0.41-0.6           | Moderate agreement       |
| 0.61-0.8           | Substantial agreement    |
| 0.81-1.00          | Almost perfect agreement |

For the BDA CMT, weighted Fleiss' kappa was 0.65 (95% confidence interval: 0.56, 0.75), which according to Landis and Koch,<sup>10,11</sup> demonstrates substantial agreement. For the sCMT, weighted Kappa was 0.51 (95% confidence interval: 0.41, 0.62), which according to Landis and Koch,<sup>10,11</sup> demonstrates moderate agreement.

The reliability of overall complexity scores in allocating patients to the same treating dentist group as the previous specialist-performed stratification was determined as moderate using the sCMT, and substantial using the BDA CMT. As the confidence intervals for both tools overlap, the two kappa results are not significantly different to each other.

## Discussion:

The overall aim of this study was to compare the stratification of complexity for individuals with disability between a case mix tool, and an experienced SND specialist, with a view to assess the suitability of the tool's use by general dentists within the Community Dental Service of the SA Dental Service.

Of the 131 participants studied, a low frequency of re-referral following the specialist-performed stratification of patients was identified, suggesting accuracy of the stratification.

The reliability of the British Dental Association case mix tool and simplified case mix tool in replicating the specialist-performed stratification was then assessed. The complexity assessments undertaken using the BDA CMT and sCMT were comprehensive, as both assessed many factors contributing to cases' complexity, including the individual's level of communication and cooperation, their medical status, access to care, and legal and ethical barriers to care. The BDA CMT also assessed the individual's oral risk factors, which is not included in the sCMT criteria.

The BDA CMT facilitated a more diverse stratification, categorising patients into five complexity bands (standard, mild, moderate, severe, and extreme). The sCMT categorised patients into three complexity bands, where the moderate and severe category were combined (standard, mild, moderate/severe). Using the BDA CMT, the complexity of the study cohort varied from mild to extreme, with almost half (47%), categorised as moderate complexity. Using the sCMT, the study cohort was stratified into two categories of mild and moderate/severe, with majority of the participants (82%) in the moderate/severe category. The sCMT distribution of patient complexity was skewed toward the more severe complexity spectrum, while the BDA CMT resulted in a middle-centric distribution.

Using weighted Fleiss' kappa, it was identified that the BDA CMT demonstrated greater reliability in replicating the specialist-performed stratification with substantial agreement (0.65), compared to only a moderate agreement with the sCMT (0.51). Overlapping 95% confidence intervals indicates the kappa results of both the CMT and sCMT are not

significantly different to each other, however the BDA CMT does have the additional benefit of offering further stratification of more complex patients with disability. While one of the purported benefits of the simplified CMT is that it offers greater efficiency, Duane et al reported that the BDA CMT only takes 40 seconds to complete.<sup>9</sup> A field trial on the use of the BDA CMT by twenty-five different community dental services in the UK reported that the tool was both easy to use and provided a reasonable reflection of the complexity of the patients assessed.<sup>8</sup>

A similar retrospective analysis of dental records was undertaken by AlKindi and Nunn, who assessed the complexity of patient cases referred into Special Care Dentistry unit at the Dublin University Dental Hospital using the BDA CMT.<sup>12</sup> They identified patient complexity ranging from standard to extreme, with just over 30% identified as either standard or mild complexity, and the most frequent being moderate complexity (40%).

The frequency distributions of the Dublin and South Australian studies cohorts are compared in Table 16. The heterogeneity of both cohorts is illustrated, and while no participants were assessed as being of “standard” complexity using either the BDA CMT or sCMT within the South Australian cohort, a significant proportion in both cohorts were identified as “mild” complexity, despite being referred for SND specialist care. These patients identified with mild complexity could be suitable to access oral healthcare services in a community setting.

Table 16

Comparison of the distribution of the level of complexity measured by the BDA CMT in two SND patient cohorts

|                              | <i>Frequency n (%)</i>        |   |
|------------------------------|-------------------------------|---|
| Level of measured complexity | SNU, Adelaide Dental Hospital | SCD clinic, Dublin Dental University Hospital |
| Standard                     | 0 (0)                         | 3 (2.1)                                       |
| Mild                         | 24 (18)                       | 40 (28.6)                                     |
| Moderate                     | 61 (47)                       | 57 (40.7)                                     |
| Severe                       | 41 (31)                       | 27 (19.3)                                     |
| Extreme                      | 5 (4)                         | 13 (9.3)                                      |
| Total                        | 131 (100)                     | 140 (100)                                     |

## Conclusion:

This is the first study of its kind to compare complexity scores assessed using the BDA CMT and sCMT to a clinician-based benchmark of complexity – in this case, a specialist-performed stratification performed by an experienced SND specialist.

The findings of this study demonstrate the heterogeneity of the South Australian population with respect to disability, and the accuracy of the specialist performed stratification of complexity. This is particularly so in relation to individuals with a mild level of disability who were able to be successfully managed by Special Needs Network dentists in the community, as reflected by the low re-referral rate back to the Special Needs Unit over a three-year period (2016–2019).

These results confirm that both the British Dental Association case mix tool CMT and sCMT are able to replicate the patient complexity stratification performed by a very experienced specialist in SND, demonstrating moderate to substantial agreement to the specialist-performed stratification of complexity for an individual with special needs. This suggests that either tools are appropriate to use as a stratification tool by community-based general dentists in South Australia.

However, the British Dental Association case mix tool (BDA CMT) demonstrated a higher reliability than the simplified case mix tool (sCMT), with an increased separation of the moderate and severe complexity categories within the BDA CMT enabling a greater degree of agreement with the specialist-performed stratification, therefore providing potentially a better alignment of patient complexity with treating dentist groups within SA Dental Service.

## **Declarations:**

### **Declaration of interests:**

The authors declare no conflicts of interest.

### **Author contributions:**

Dr Trudy Lin was the principal investigator of this research.

Associate Professor Sharon Liberali and Dr Mark Gryst were supervisors of this research.

Suzanne Edwards was the statistician.

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