The BRIGHT tool

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Abstract

Objective: the size of the burden of unmet needs of older people living in the community is unknown. We aim to validate a brief postal questionnaire, the Brief Risk Identification of Geriatric Health Tool (BRIGHT) questionnaire, to find cases of older people with disabilities (case-finding) living in the community.

Methods: community-dwelling patients over the age of 75 years were invited from two general practitioners in Auckland, New Zealand. Participants completed the 11-item BRIGHT questionnaire twice and were assessed at home using the Minimum Dataset for Home Care (MDS-HC) comprehensive geriatric assessment tool by a trained gerontology nurse. Retest reliability of the BRIGHT was assessed with a correlation coefficient, and receiver operator characteristic (ROC) curves were used to assess the utility of the tool against standard outputs from the MDS-HC reflecting level of disability; the instrumental activities of daily living clinical assessment protocol (IADL CAP), and the MAPle score for dependency.

Results: 101 participants completed both the BRIGHT questionnaires and the comprehensive MDS-HC assessment. Test-retest reliability was modest with a correlation of 0.77. A sensitivity of 0.86 and specificity of 0.86 were observed for a score of 3 or more on the questionnaire in relationship to the IADL CAP. A sensitivity of 0.65 and specificity of 0.84 were observed when BRIGHT questionnaire score of 3+ was related to the MAPle score from the MDS-HC assessment.

Conclusions: the BRIGHT questionnaire has acceptable utility in identifying community-dwelling older people with disability, and excellent utility in ruling them out of needing further assessment. This tool may be useful as part of an intervention process to detect unmet needs and to improve systematic surveillance of primary care populations.

Keywords: case-finding, disability, postal questionnaire, utility, elderly

Introduction

For three decades, the need for systematic processes to identify older people with unmet needs and to offer solutions has been debated [1]. In New Zealand in 2001, older people visited the general practitioner (GP) six to nine times a year [2], but there remains a high frequency of unreported and unmet needs [1, 3] which does respond to health professionals conducting health assessments at home [1, 3–5]. Subsequent reviews have shown mixed results about the effect of such preventive visits [6, 7]. Case-finding may be one way to target assessment resources towards those that may benefit from them the most.

Proactive case-finding is the systematic identification of cases of unmet needs not previously identified to health providers [8, 9]. Case-finding has the potential to target community-dwelling older people for comprehensive assessment and simultaneously reassure clinicians that those not recently visiting the GP and identified as ‘well’, are not currently in need of health intervention.

The minimum dataset–home care (MDS-HC) is a comprehensive geriatric assessment process developed and validated by an international team of researchers, the interRAI group, and proven to improve health for older people in the community [10, 11]. The MDS-HC is one of a suit of tools, termed the interRAI assessment tools, which include brief tools, the Self-reliance and Contact assessments. The brief interRAI tools identify older people in need of the more comprehensive assessment, MDS-HC. All tools are designed to be administered by trained assessors [12, 13]; however, availability of trained assessors to use such brief tools on older people exceeds the capacity of most health care systems. An efficient, low resource and valid way of identifying those with unmet needs is required. A self-completion postal tool may be one way to contribute to health surveillance of older people.
A number of self-administered questionnaires have been developed, however, there is a lack of evidence for the performance of these and a lack of consistency in use of a 'gold standard' against which to measure their performance [14]. The postal method of administering a case-finding questionnaire achieved the highest response rates when compared with nurse or lay-person-administered questionnaires [15].

A New Zealand pilot study found a five-item postal questionnaire to be as sensitive and specific in identifying disabilities as other commonly used tools [16, 17]. A new 11-item case-finding tool, the Brief Risk Identification of Geriatric Health Tool (BRIGHT) questionnaire was developed by expanding the 5-item tool [17] with single items from the interRAI Self-Reliance Index, and the interRAI Contact Assessment [10]. The BRIGHT questionnaire was formatted and reworded for self-completion and piloted on 19 older people to evaluate ease of answering. Further reordering improved flow of the questions.

This article reports the utility of the BRIGHT questionnaire (see Appendix 1 in the supplementary data on the Journal’s website) in identifying community-dwelling older people with disability-related needs. The questionnaire is assessed against the interRAI MDS-HC home care assessment [10, 11].

**Methods**

**Participant recruitment**

Two GPs from the Auckland area volunteered to participate in the validation study. Eligible participants were community-dwelling, aged 75 years or older, who could communicate in English and were not terminally ill. Two recruitment methods were used.

Postal recruitment: Potential eligible participants were selected randomly from the practice register until a total of 120 was reached. Each eligible participant was mailed a letter from their GP inviting them to participate in the study, with information about the study, a consent form and the 11-item BRIGHT questionnaire. They were asked to read the information, sign the consent form if they agreed to participate in the study, and return the completed BRIGHT questionnaire in a pre-paid envelope.

Waiting room recruitment: Information about the study was circulated to people aged over 75 years while waiting for their consultation. They were then approached in the waiting room of the surgery by reception staff and given the BRIGHT questionnaire. Interested older adults filled in the questionnaire, and their contact details were forwarded to research staff who contacted the potential participant, attained informed consent and arranged a home visit.

**Data collection**

Each person who agreed to participate was phoned within 5 days to have an assessor complete the full MDS-HC assessment in the participant’s home. The assessor was blinded to the results of the BRIGHT questionnaire. At the beginning of the assessment a second BRIGHT questionnaire was completed by the participant to evaluate test–retest reliability. Assessors were blinded to the second questionnaire result by the older participant placing it in a sealed envelope.

**Disability assessment gold standard**

Disability is experienced by people with an impairment that interferes with their ability to successfully fulfill their potential and complete their desired daily tasks [18]. In the context of this study, disability is defined with the use of a standard assessment process, the MDS-HC comprehensive assessment. The MDS-HC was completed by the trained gerontology nurse assessor on all enrolled participants. Standard interRAI software delivers, as an outcome of the MDS-HC, a score called the MAPLe score. The MAPLe is based on a range of clinical variables including presence of activities of daily living (ADL) impairment; cognitive impairment; wandering; behaviour problems and the institutional risk Clinical Assessment Protocol (CAP). The algorithm of these variables has been shown to predict risk of adverse outcomes such as nursing home placement and caregiver distress. The MAPLe algorithm was derived with MDS-HC data from Ontario, Canada, and validated with samples of home care clients in three other Canadian provinces (Nova Scotia, Manitoba, British Columbia); two US states (Michigan, Georgia); Italy; Japan; Iceland and Sweden. People are differentiated into five priority levels, yielding a score of 1–5, with people in the high priority level being nearly nine times more likely to be admitted to a long-term care facility than the low priority clients. This can then be used as a means of identifying those who should be treated with higher priority for services, and to facilitate more effective targeting of appropriate services. Those with a MAPLe score of 1 or more in this study were considered to have a disability.

A second measure of disability was the Instrumental Activities of Daily Living (IADL) clinical assessment protocol from the MDS-HC which is triggered by an algorithm derived from the IADL questions of the MDS-HC. The algorithm identifies the IADL deficiencies in the older person and is expressed as present or absent.

Both disability measures are standard outputs from the MDS-HC and were administered to all participants and are used as the ‘gold standard’ against which the BRIGHT questionnaire was measured. For the purposes of this manuscript, use of the term disability in these participants means meeting the criteria of either the IADL CAP or a MAPLe score of 1 or more.

**Analysis**

Responses on the BRIGHT questionnaire were summed; one point per response indicating need; that is ‘1’ for ‘no’ on question 1 and ‘1’ for ‘yes’ on questions 2–11. Repeatability of the BRIGHT questionnaire was established...
using standard correlation coefficients between the first and second administration of the BRIGHT questionnaire. Internal consistency was established with the Cronbach’s alpha statistic. Receiver operator characteristic (ROC) curves [19] were constructed to compare the score on the initial BRIGHT questionnaire and the ‘gold standards’; a score of 1 or greater on the MAPLe scale of the MDS-HC, and separately, the IADL CAP. Sensitivity and specificity were calculated for cut-off scores of 2, 3 and 4 on the BRIGHT questionnaire.

The Northern Regional Ethics Committee, Auckland, New Zealand, approved the study.

Results
A total of 120 people completed the BRIGHT questionnaire. A total of 106 completed the MDS-HC assessment. Waiting room recruitment yielded 54 participants over 2 weeks. During that time, it was estimated that 75 waiting room patients were over 75 years of age (estimated response rate 72%). Staff was unable to count exactly how many older people were not offered the BRIGHT questionnaire. In total, 90 questionnaires were mailed out from the practitioners representing a random sample of a total of 150 eligible patients on the register. Of these, 74 were returned (of which 6 refused to participate). Of the 66 completing the questionnaire (73%), 4 refused the MDS-HC assessment; 1 was too ill, 1 was unable to be contacted and 2 refused. Complete data was available on 101 individuals with both the BRIGHT questionnaire administered on 2 occasions and the completed MDS-HC assessment. Characteristics of the sample are shown in Table 1.

Test–retest reliability was acceptable with a Pearson correlation of 0.77. The BRIGHT questionnaire was re-administered on average 8 days later (SD 5.3). There was high internal consistency of the tool with a Cronbach alpha of 0.77.

Nine people (9%) had a MAPLe score (gold standard) of 1 or more, indicating disability, and seven had the IADL-deficit CAP from the MDS-HC. Comparing the score on the BRIGHT questionnaire with a MAPLe score of more than 1 (moderate and severe disability), the area under the curve of the ROC was 0.85, (P = 0.003) indicating the BRIGHT questionnaire exhibited a reasonable level of discrimination. With a score of 1 or more on the BRIGHT questionnaire the specificity was 0.52 (48 of 92 correctly identified as not having any disability), and sensitivity 0.88 (7 of 8 correctly identified as having some disability). With a score of 3 or more on the BRIGHT questionnaire, the specificity was 0.84 (78 of 92 correctly identified as not having any disability, true negative) and sensitivity 0.65 (5 of 8 correctly identified as having disability, true positive) (Table 2).

Comparing the BRIGHT score to the IADL cap from the MDS-HC showed an area under the ROC curve of 0.931 (0.873–0.99) P = 0.000. This corresponds to a sensitivity of 86% and specificity of 86% at the positivity criterion of 3 or more for the BRIGHT questionnaire (Table 2). This means that only 1 older person with disability according to the IADL CAP was misclassified by the BRIGHT questionnaire, and there were 20 false positives out of a total of 101 older people (Figure 1).

Discussion
This new BRIGHT questionnaire had reasonable utility in identifying those assessed as having disability using both the MAPLe and IADL CAP from the interRAI MDS-HC comprehensive assessment as gold standards. It is a reliable test with acceptable repeatability and high internal consistency. This new tool, developed particularly to mesh with the MDS-HC comprehensive assessment, and tested in the primary care population may be useful in targeting future assessment programmes to those in greatest need.

This study established the utility of the tool in identifying disability. The optimum cut-off level, 3 or more, of the BRIGHT questionnaire was chosen to maximise utility in ruling out those without any disability, while capturing the maximum with disability. The trade-off between sensitivity and specificity is demonstrated by the ROC curves in Figure 1 [19]. If resources are plentiful and there is capacity for increasing comprehensive assessments the lower cut point (1+) would capture 90% of the cases of disability, but add the cost of an additional 29 false positives. If

<table>
<thead>
<tr>
<th>Case-finding tool score</th>
<th>2 or more</th>
<th>3 or more</th>
<th>4 or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>IADL CAP-triggered</td>
<td>1.00</td>
<td>0.86</td>
<td>0.43</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.80</td>
<td>0.86</td>
<td>0.94</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.80</td>
<td>0.86</td>
<td>0.94</td>
</tr>
<tr>
<td>MAPLe score ≥1</td>
<td>0.67</td>
<td>0.65</td>
<td>0.33</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>0.77</td>
<td>0.84</td>
<td>0.94</td>
</tr>
<tr>
<td>Specificity</td>
<td>0.77</td>
<td>0.84</td>
<td>0.94</td>
</tr>
</tbody>
</table>

IADL, instrumental activities of daily living; MAPLe, disability outcome from the MDS-HC.

Table 1. Demographic characteristics of a sample of primary care patients

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 55 (%)</td>
<td>n = 66 (%)</td>
<td>n/121</td>
</tr>
<tr>
<td>Postal recruitment</td>
<td>41 (75)</td>
<td>25 (38)</td>
<td>66 (55)</td>
</tr>
<tr>
<td>Waiting room recruitment</td>
<td>14 (25)</td>
<td>41 (62)</td>
<td>55 (45)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ European</td>
<td>53 (95)</td>
<td>59 (94)</td>
<td>112 (94)</td>
</tr>
<tr>
<td>Other</td>
<td>3 (9)</td>
<td>4 (6)</td>
<td>7 (6)</td>
</tr>
<tr>
<td>Age mean (SD)</td>
<td>80.1 (3.9)</td>
<td>81.6 (5.6)</td>
<td>80.9 (4.9)</td>
</tr>
<tr>
<td>Completed MDS-HC</td>
<td>49 (89)</td>
<td>59 (90)</td>
<td>108 (89)</td>
</tr>
<tr>
<td>IADL CAP-triggered</td>
<td>3 (6)</td>
<td>6 (9)</td>
<td>9 (8)</td>
</tr>
<tr>
<td>Maple score ≥1</td>
<td>12 (22)</td>
<td>10 (15)</td>
<td>22 (18)</td>
</tr>
<tr>
<td>Admitted to hospital within 6 months</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Sensitivity and specificity of three cut points on the case-finding tool compared with the MAPLe and the IADL CAP of the MDS-HC
Figure 1. ROC curve of BRIGHT tool score versus (a) IADL CAP-triggered and (b) MAPLe score >1 from the MDS-HC showing an area under the curve of 0.85 (0.643–0.966, $P = 0.003$) and 0.931, (0.873–0.990 $P = 0.000$) respectively. * Scores on the BRIGHT questionnaire.

The BRIGHT questionnaire is set in the context of high-continuity primary health care [20, 21] then it is more likely that people with false negative results will subsequently be seen and the higher cut point of 3+ may be more appropriate. In this context, resources may be less plentiful, and thus, the lower rate of false positives is valued. It is also important to understand that this tool works better for identifying IADL deficiency than identifying potential for adverse outcome (MAPLe score). This may be because the majority of the questions are of a functional nature. A prospective study with development of disability and adverse outcome as the endpoint would test utility of the tool over time. Further work should outline whether those identified with the BRIGHT questionnaire were ‘known’ to their health professionals to have disability. The intention was to identify unknown and unmet needs.

Utility of the BRIGHT questionnaire compares very well with other tools designed for case-finding. Other scales of five and six items have yielded sensitivities of 0.79, [22] 0.75 [23] and 0.87 [24] with specificities of 0.82, [22] 0.52 [23] and 0.50 [24]. Scales with item lengths of 8 and 9 exhibited high sensitivities of 0.95 [25] and 0.91 [26] and modest specificities: 0.68 [25] and 0.64 [26]. Lower specificity means moderate numbers of false positive cases requiring comprehensive assessment. The current scale compares very favourably showing better levels of specificity than most other reported measures.

Case-finding tools have been used successfully with the MDS-HC [27]. However, in Roberts’ study more than 60% of those responding to the questionnaire triggered the positivity criterion. The MDS-HC seldom yielded referral to additional services as most of the identified unmet needs were managed by the assessor through discussion with clients. A much longer postal health promotion tool identified between 18 and 50% of older Europeans as having an identifiable health issue in need of intervention to prevent further complications. [28] The targeting questionnaire in the UK MRC assessment trial triggered 10% of the sample for further assessment, however, the targeted strategy resulted in the same benefit as the universal assessment strategy [29] suggesting that most needs of community-dwelling older people had been met by the preceding decade of ongoing assessment for older people in the United Kingdom. In New Zealand, as in other counties, there is no systematic health surveillance process, and there continues to be a minority of older people consuming the majority of health expenditure [30]. The potential for prevention of progression of disability remains an urgent concern.

**Limitations**

This sample was small and very able. The fact that there were less than 10 people with significant levels of disability to trigger the MAPLe score (10%) limits the generalisability of these results. The response rate is uncertain as the exact denominator for practice recruitment could not be established and there is a potential for response bias as those with good health may have been more likely to participate in the study. Reproduction of this result in larger samples and samples with higher levels of disability will be important to understand generalisability. A prospective study with change in level of ability as the gold standard [23] may be a more appropriate reference standard against which to validate this questionnaire.

Validation of the BRIGHT questionnaire as useful in identifying those with disabilities will lead to further research testing its effectiveness in reducing disability and preventing residential care placement. This BRIGHT questionnaire compared very favourably with the IADL CAP and the MAPLe score, both validated outcomes from the MDS-HC assessment indicating significant levels of disabilities in older
people. This study should be replicated in larger more diverse samples to ensure that the promising results seen here are generalisable. The true level of unrecognised needs is not known in New Zealand, and systematic processes may assist in targeting interventions to meet unmet needs.

**Key points**

- Accurately identifying older people with disabilities using a postal questionnaire may enhance health surveillance in primary care.
- The BRIGHT tool, an 11-item questionnaire showed high sensitivity and specificity for case-finding older people with disabilities as measured by a comprehensive geriatric assessment.
- Further research is needed to understand the use of BRIGHT in reducing disability.

**Acknowledgements**

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**Conflict of interest**

None of the authors have any real or perceived conflict of interests.

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**Supplementary data**

Supplementary data for this article are available at *Age and Ageing* online.

**References**


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