Development of a Minimum Data Set-based depression rating scale for use in nursing homes

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Abstract

Background: depression is common but under-diagnosed in nursing-home residents. There is a need for a standardized screening instrument which incorporates daily observations of nursing-home staff.
Aim: to develop and validate a screening instrument for depression using items from the Minimum Data Set of the Resident Assessment Instrument.
Methods: we conducted semi-structured interviews with 108 residents from two nursing homes to obtain depression ratings using the 17-item Hamilton Depression Rating Scale and the Cornell Scale for Depression in Dementia. Nursing staff completed Minimum Data Set assessments. In a randomly assigned derivation sample ($n = 81$), we identified Minimum Data Set mood items that were correlated ($P < 0.05$) with Hamilton and Cornell ratings. These items were factored using an oblique rotation to yield five conceptually distinct factors. Using linear regression, each set of factored items was regressed against Hamilton and Cornell ratings to identify a core set of seven Minimum Data Set mood items which comprise the Minimum Data Set Depression Rating Scale. We then tested the performance of the Minimum Data Set Depression Rating Scale against accepted cut-offs and psychiatric diagnoses.
Results: a cutpoint score of 3 on the Minimum Data Set Depression Rating Scale maximized sensitivity (94% for Hamilton, 78% for Cornell) with minimal loss of specificity (72% for Hamilton, 77% for Cornell) when tested against cut-offs for mild to moderate depression in the derivation sample. Results were similar in the validation sample. When tested against diagnoses of major or non-major depression in a subset of 82 subjects, sensitivity was 91% and specificity was 69%. Performance compared favourably with the 15-item Geriatric Depression Scale.
Conclusion: items from the Minimum Data Set can be organized to screen for depression in nursing-home residents. Further testing of the instrument is now needed.

Keywords: *depression rating scale, Minimum Data Set, nursing homes*

Introduction

Estimates of the prevalence of major depression in nursing-home populations range from 10 to 22%. Another 15–50% of residents suffer from depressive symptoms that do not meet American Psychiatric Association Diagnostic and Statistical Manual (DSM) criteria for major depression [1–8]. While high rates of depression have been reported in research studies, physicians often fail to identify depressed residents, and these residents may not receive antidepressant medications or other therapeutic services [9–11]. This is unfortunate, given the disabling effects of depression and its responsiveness to appropriate therapy, even in long-term care settings [12–16]. Nurses and other care staff may be able to contribute important information toward the recognition of depressed residents [3, 11, 17–19].

Most depression diagnosis and rating assessment instruments rely upon interviews by trained staff, and their widespread application may be impractical

[20–23]. By contrast, screening instruments, such as the Geriatric Depression Scale, generally rely on self-report of symptoms [24, 25]. While the Geriatric Depression Scale has been validated in community and hospital settings [24–27], it must be administered face-to-face to functionally disabled elders, and it performs less well among nursing-home residents with cognitive impairment [17, 23, 28]. Given the practical limitations of existing instruments, a screening tool is needed that draws upon the routine, daily observations of licensed care staff.

We have developed a new observation-based instrument, the Minimum Data Set Depression Rating Scale, to screen for depression in nursing-home residents. The instrument is derived from mood and behavioural items in the Minimum Data Set, the systematic collection of standardized data incorporated into the Resident Assessment Instrument [29–31]. Previous studies have established the inter-rater reliability of Minimum Data Set items in different countries, including the reliability of the mood and behavioural items [29, 32]. However, there is no report of how the Minimum Data Set mood items can be best combined to identify residents with depressive symptoms requiring further evaluation and possible treatment.

Methods

Mood items in the Minimum Data Set (version 2.0)

There are 16 mood indicators capturing verbal and non-verbal expressions of distress (Table 1). All Minimum Data Set mood items have value ranges from 0 to 2—where 0 indicates that the resident did not exhibit the symptom in the last 30 days, 1 indicates that the resident exhibited the symptom up to 5 days a week, and 2 indicates the occurrence of the symptom 6 or 7 days a week. Direct-care staff are instructed to score each item without regard to cause or environment.

Criterion measures of depression

The Minimum Data Set Depression Rating Scale was constructed and validated by comparison with two commonly used measures of depression. The 17-item Hamilton Depression Rating Scale is a standard rating instrument for psychiatric research and has been validated in disabled and medically ill elderly populations [20, 33, 34]. In our interviews, we omitted the libido item. The 19-item Cornell Scale for Depression in

Table 1. Mood items in Minimum Data Set version 2.0

Verbal expressions

a   Resident made negative statements (passive suicidal ideation)—'Nothing matters; Would rather be dead; What's the use; Regret having lived so long; Let me die'

b   Repetitive questions—'Where do I go; What do I do?'

c   Repetitive calls for help—'God help me'

d   Persistent anger and irritability with self or others—easily annoyed, anger at placement in nursing home; anger at care received

e   Self-deprecation—'I am nothing; I am of no use to anyone'

f   Expressions of what appear to be unrealistic fears—fear of being abandoned, left alone, being with others

g   Expressions of panic/recurrent statements that something terrible is about to happen: e.g. believes he or she is about to die, have a heart attack

h   Repetitive health complaints—persistently seeks medical attention, obsessive concern with body functions

i   Repetitive anxious complaints (non-health-related)—persistently seek attention/reassurance regarding schedules, meals, laundry, clothing, relationship issues

Non-verbal expressions

j   Diurnal mood variation—unpleasant mood in morning

k   Sleep disturbance—insomnia/change in usual sleep pattern

l   Sad, pained, worried facial expressions—furrowed brows

m   Crying, tearfulness

n   Repetitive physical movements (agitation)—pacing, hand wringing, restlessness, fidgeting, picking

o   Withdrawal from activities of interest—no interest in long standing activities or being with family/friends

p   Reduced social interaction

Dementia was designed for use in cognitively impaired geriatric populations. Hamilton Depression Rating Scale scores of ≥ 12 and Cornell scale scores of ≥ 8 suggest the presence of at least mild depression. Hamilton Depression Rating Scale scores of ≥ 18 and Cornell scale scores of ≥ 12 correspond to a high likelihood of major depression [11, 21, 22, 33–35].

Subjects

We used a 108-person sample from two nursing facilities to derive and validate the Minimum Data Set Depression Rating Scale. Eighty-two subjects were residents of the Hebrew Rehabilitation Center for Aged in Boston, Massachusetts, USA, and 26 were residents of the Providence Villa in Scarborough, Ontario, Canada. The full sample from both sites ($n = 108$) was randomly assigned to either a derivation sample ($n = 81$) or a validation sample ($n = 27$), the cases from the validation sample permitting an independent assessment of the correlations and sensitivity/specificity values found in the derivation sample.

The Hebrew Rehabilitation Center for Aged is a 725-bed multi-level long-term care facility. Of the 82 subjects from this location, 49 were referred for baseline evaluations as potential candidates for a depression intervention trial. We randomly selected the remaining 33 subjects to generate a sample along the full cognitive and emotional spectrum found in long-term care facilities. Providence Villa is a 290-bed Canadian home for the aged. Residents were randomly sampled and we included those who gave consent to participate in the study.

Assessment of subjects

For the subjects from the Hebrew Rehabilitation Center for Aged, a trained research assistant conducted semi-structured interviews with subjects and with their nurses, all of whom were trained in Minimum Data Set assessment. The interviews included questions designed to permit ratings with the Hamilton Depression Rating Scale and Cornell scale [20, 33, 37]. Interviews were videotaped and rated later by one of the investigators, thus yielding Cornell scale and Hamilton Depression Rating Scale ratings for the subject interviews and for the nurse interviews. The nurses scored the Minimum Data Set items concurrently with the interviews. In the Providence Villa sample, Cornell scale and Hamilton Depression Rating Scale ratings were conducted by a doctoral level psychologist and a research assistant supervised by the psychologist.

To generate Hamilton Depression Rating Scale and Cornell scale scores that incorporated information derived from both the nurse and patient interviews in the Hebrew Rehabilitation Center for Aged sample, we used the highest score for each individual Hamilton

Depression Rating Scale and Cornell scale item. This convention grants equal value to a caregiver report of a symptom or behaviour and to a patient self-report or direct observation by the interviewer. This convention most closely resembles clinical practice and operationalizes the instructions given for the Cornell scale and adaptations of the Hamilton Depression Rating Scale [21, 22, 34].

Psychiatric diagnoses

For the subjects from the Hebrew Rehabilitation Center for Aged, a geriatric psychiatrist independently reviewed the videotaped interviews and generated a diagnosis based on DSM-IV criteria [38]. Each diagnosis was classified as major depression, non-major depression, or no mood disorder. Non-major depression diagnoses included dysthymia, adjustment disorder with depressed mood, dementia with depression, and depression not otherwise specified. In addition, residents of the Hebrew Rehabilitation Center for Aged were administered the 15-item Geriatric Depression Scale [24, 27].

Analytic strategy

Using the 81-subject derivation sample, we performed a series of analyses to identify the subset of Minimum Data Set mood items that would best correspond to the summary scores for the Hamilton Depression Rating Scale and Cornell scale. First, we identified Minimum Data Set mood items that were significantly correlated with the Hamilton Depression Rating Scale and Cornell scale. These items were then factored, using an oblique rotation, to identify the distinct set of concepts represented in this item pool. Each set of conceptually distinct items derived from the factor analysis was individually regressed using step-forward ordinary least-squares regression modelling to obtain the best set of Minimum Data Set items to predict the Hamilton Depression Rating Scale and Cornell scale criterion measures. Separate models were created for each of the factor groupings, thus ensuring that at least one item from each conceptual area would be included in the summary Minimum Data Set Depression Rating Scale.

We then determined the cutpoint for the summed Minimum Data Set Depression Rating Scale that best captured the subset of patients with at least mild to moderate depression as indicated by the Hamilton Depression Rating Scale and Cornell scale. For this purpose, Cornell scale and Hamilton Depression Rating Scale scores were dichotomized at 8 and 12, respectively. Once a cutpoint was established, its performance was measured in the validation sample. The sensitivity and specificity of the cutpoint was also measured against psychiatric diagnoses for the 82 residents of the Hebrew Rehabilitation Center for

Aged. The performance of the Minimum Data Set Depression Rating Scale in identifying depressed subjects from the Hebrew Rehabilitation Center for Aged group was also compared with the 15-item Geriatric Depression Scale. All analyses were completed using SPSS software.

Results

Sample characteristics

The mean age was 86 years (range 42–100 years, SD 10.0) and 72% were women. Ninety subjects (83%) scored ≥ 1 on at least one of the Minimum Data Set mood items, reflecting the purposeful over-sampling of symptomatic residents. Among subjects in the derivation sample, the average Hamilton Depression Rating Scale score was 10; 27% had scores of ≥ 12, suggesting at least mild depression. For the Cornell scale, the average score was 9.5 and 21% had scores of ≥ 8. As expected, the correlation between Hamilton Depression Rating Scale and Cornell scale was high (0.96).

Creation of the Minimum Data Set Depression Rating Scale

Correlation of criterion measures of depression with Minimum Data Set mood items

Table 2 shows the Pearson correlations of each of the 16 Minimum Data Set mood items with the Hamilton Depression Rating Scale and the Cornell scale. Correlations with the Hamilton Depression Rating Scale ranged from 0.15 to 0.54, and 13 items had correlations that were significant at the 0.05 level or better. Correlations with the Cornell scale ranged from 0.12 to 0.54, and 11 items had correlations that were significant at the 0.05 level or better. Four of the mood items (repetitive questions, repetitive calls for help, repetitive physical movements, and reduced social interaction) were dropped from further consideration because of non-significant correlations with one or both criterion measures.

Factor analyses of mood items and identification of rating scale items

The 12 remaining Minimum Data Set mood items were factored and rotated; the oblique solution resulted in five identifiable factors (Table 3).

For the items comprising each of the five factors, a series of step-forward regression analyses produced identical subsets of items for the Hamilton Depression Rating Scale and Cornell scale regression models. These items are indicated in Table 3.

The resulting Minimum Data Set Depression Rating

Table 2. Pearson correlation of Minimum Data Set mood items and depression scale scores

Mood item		Hamilton	Cornell
a	Negative statements	0.35[b]	0.41[b]
b	Repetitive questions	0.23[a]	0.18
c	Repetitive calls for help	0.20	0.19
d	Persistent anger with self and others	0.44[b]	0.45[b]
e	Self-deprecation	0.34[b]	0.32[b]
f	Expressions of unrealistic fears	0.50b	0.48[b]
g	Expressions of panic	0.42[b]	0.38[b]
h	Repetitive health complaints	0.54[b]	0.54[b]
i	Repetitive anxious complaints	0.47[b]	0.40[b]
j	Diurnal mood variation	0.33[b]	0.33[b]
k	Sleep disturbance	0.28[a]	0.31[b]
l	Sad, pained, worried facial expression	0.53[b]	0.48[b]
m	Crying, tearfulness	0.30[b]	0.29[b]
n	Repetitive physical movements	0.15	0.12
o	Withdrawal from activities of interest	0.22[a]	0.21
p	Reduced social interaction	0.21	0.21

[a]$P \leq 0.05$, [b]$P \leq 0.01$.

Scale, outlined in Table 4, has a score range of 0–14. The Cronbach α measure of internal consistency for this summary scale is within the acceptable range with a coefficient of 0.75 in the derivation sample and 0.71 in the validation sample.

Scale performance

The Minimum Data Set Depression Rating Scale achieved correlations of 0.69 with the Cornell scale and 0.70 with the Hamilton Depression Rating Scale in the derivation sample. Correlations with the criterion measures were similar in the validation sample (0.70 and 0.71 respectively). A score of ≥ 3 on the Minimum Data Set Depression Rating Scale offered the most favourable cutpoint, maximizing sensitivity with a minimal loss of specificity for Cornell scale and Hamilton Depression Rating Scale thresholds. The performance characteristics at this cutpoint are shown in Table 5. The Minimum Data Set Depression Rating Scale was then tested against psychiatric diagnosis for the 82 subjects from the Hebrew Rehabilitation Center for Aged, yielding a sensitivity for detecting depression of 91%.

The final test of the Minimum Data Set Depression Rating Scale is illustrated by the receiver operating characteristic curve depicted in Figure 1. The Minimum Data Set Depression Rating Scale was more

Table 3. Oblique factor analysis of Minimum Data Set mood items significantly correlated with the Hamilton Depression Rating scale and Cornell scale

	Factor loading
Disturbed mood	
Sad, pained, worried facial expression[a]	0.83
Anger and irritability[a]	0.74
Withdrawal from activities of interest	0.62
Unpleasant mood in morning	0.61
Anxiety	
Repetitive anxious complaints/concerns (non-health-related)[a]	
Sleep disturbance—insomnia/change in usual sleep pattern	0.76
Repetitive health complaints[a]	0.74
Fear	
Expressions of panic/something terrible is about to happen	0.87
Expression of unrealistic fears[a]	0.81
Loss of meaning	
Self-deprecation	0.91
Negative statements (passive suicidal ideation)[a]	0.88
Affect	
Crying, tearfulness[a]	0.88

[a]Items included in a subset produced by a series of step-forward regression analyses produced identical subsets of items for both the Hamilton Depression Rating Scale and Cornell scale regression models.

Table 4. The Minimum Data Set Depression Rating Scale assessment

Assessment process

Initiate a conversation with the resident. Some residents talk more about their feelings than others and will either tell someone about their distress, or tell someone only when directly asked how they feel. Other residents may be unable to articulate their feelings (cannot find the words to describe how they feel, or lack insight or cognitive capacity). Observe residents carefully for any indicator. Consult with direct-care staff over all shifts, if possible, and family who have direct knowledge of the resident's behaviour. Relevant information may also be found in the clinical record.

Scoring

Code for indicators observed in last 30 days, irrespective of the assumed cause: 0, indicator not exhibited in last 30 days; 1, indicator of this type exhibited at least once in last 30 days and up to 5 days a week; 2, indicator of this type exhibited daily or almost daily (6, 7 days a week)

Items

I   Resident made negative statements (passive suicidal ideation)

II   Persistent anger and irritability with self or others

III   Expressions of what appear to be unrealistic fears

IV   Repetitive health complaints

V   Repetitive anxious complaints/concerns (non-health-related)

VI   Sad, pained, worried facial expressions

VII   Crying, tearfulness

sensitive and specific than the 15-item Geriatric Depression Scale in detecting depression among these subjects.

Discussion

We have described the development and performance of a new instrument to screen for the presence of depressive symptoms in nursing-home residents. A major strength of this instrument is its reliance on the observations of daily nursing staff as incorporated into a standardized assessment instrument, the Minimum Data Set. Thus, the Minimum Data Set Depression Rating Scale draws on continuous observations by staff involved in the daily lives of nursing home residents, rather than on one-off self-reports or interviews. Furthermore, the screening process does not place any additional burden on staff because it is derived fully from the Minimum Data Set assessment. Minimum Data Set Depression Rating Scale scores are easily generated for each resident, and residents who score ≥3 on the 7-item scale would be appropriate candidates for further evaluation.

The Minimum Data Set Depression Rating Scale performs well when validated against two interview-based criterion measures, the Hamilton Depression Rating Scale and the Cornell Scale for Depression in Dementia, both of which have been tested and validated in geriatric populations. Furthermore, the Minimum Data Set Depression Rating Scale demonstrated excellent sensitivity and acceptable specificity compared with psychiatric diagnosis based on DSM-IV criteria, thus providing independent validation based on the same interview observations. The Minimum Data Set Depression Rating Scale also demonstrates content validity. Through a factor analysis, we identified five independent domains captured by those Minimum Data Set mood and behaviour items, which were positively correlated with the criterion measures. These domains capture the range of depressive findings observed in this population [10, 39–43].

This study has several limitations. We relied upon a relatively small sample of nursing-home residents from only two facilities, and there were slight differences in data collection at the two sites. We also included in our sample more symptomatic residents than might be found in unselected nursing-home populations. We relied heavily upon two relatively similar interview-based measures of depression, the Hamilton Depression Rating Scale and

Table 5. The performance characteristics of the Minimum Data Set Depression Rating Scale at a cutpoint of 3 in the derivation and validation samples and in subjects from the Hebrew Rehabilitation Center for Aged (HRCA): correlation with Cornell scale, Hamilton Depression Rating Scale and American Psychiatric Association Diagnostic and Statistical Manual, version IV (DSM-IV) diagnosis of depression

| | | %, by sample | | |
| | | Derivation ($n = 81$) | Validation ($n = 27$) | HRCA only ($n = 82$) |
Criterion	Test			
Cornell[a]	Prevalence	62	41	–
	Sensitivity	78	82	–
	Specificity	77	69	–
	Positive predictive value	85	64	–
	Negative predictive value	69	85	–
	Accuracy	78	74	–
Hamilton[b]	Prevalence	43	30	–
	Sensitivity	94	88	–
	Specificity	72	63	–
	Positive predictive value	72	50	–
	Negative predictive value	94	92	–
	Accuracy	81	70	–
DSM-IV[c]	Prevalence	–	–	66
	Sensitivity	–	–	91
	Specificity	–	–	69
	Positive predictive value	–	–	80
	Negative predictive value	–	–	86
	Accuracy	–	–	82

Positive predictive value, the probability of being a true positive, given a positive result; negative predictive value, the probability of being a true negative given a negative result; accuracy, proportion of correct classifications among all classifications (for positive and negative tests).
[a]Cornell threshold score of ≥ 8, indicative of at least mild depression.
[b]Hamilton threshold score of ≥ 12, indicative of at least mild depression.
[c]DSM-IV diagnosis of major or non-major depression.

Cornell scale. While the latter was adapted from the Hamilton Depression Rating Scale for use in cognitively impaired geriatric populations, the Hamilton Depression Rating Scale itself has been used primarily in younger subjects. One important advantage of these measures is that they are continuous, rather than categorical measures. Thus, they capture a spectrum of depressive symptomatology and allow characterization of individuals with less severe symptoms. Such milder forms of depression may be disabling in elderly patients, and nursing-home residents may move back and forth between major and non-major depression [1, 2, 6, 44–48].

In conclusion, we have developed a screening instrument which applies the Resident Assessment Instrument and Minimum Data Set toward the identification of depressed nursing-home residents. The Minimum Data Set Depression Rating Scale utilizes daily observations of nursing-home staff as incorporated into a routine, standardized assessment protocol. Nursing-home residents who score above the cutpoint are appropriate candidates for further evaluation. Thus, the Minimum Data Set Depression Rating Scale may be important in the care of nursing-home residents, as well as in targeting resources. Further clinical testing and evaluation are now required.

Key points
- There is a need for a standardized instrument to screen for depression in nursing homes which incorporates daily observations of nursing staff.
- The Minimum Data Set Depression Rating Scale is a depression screening instrument derived from items in the Minimum Data Set of the Resident Assessment Instrument.
- This depression rating scale performs well when tested against cut-offs for depression from interview-based scales. It also performs well and compares favourably with the Geriatric Depression Scale when tested against psychiatric diagnoses.
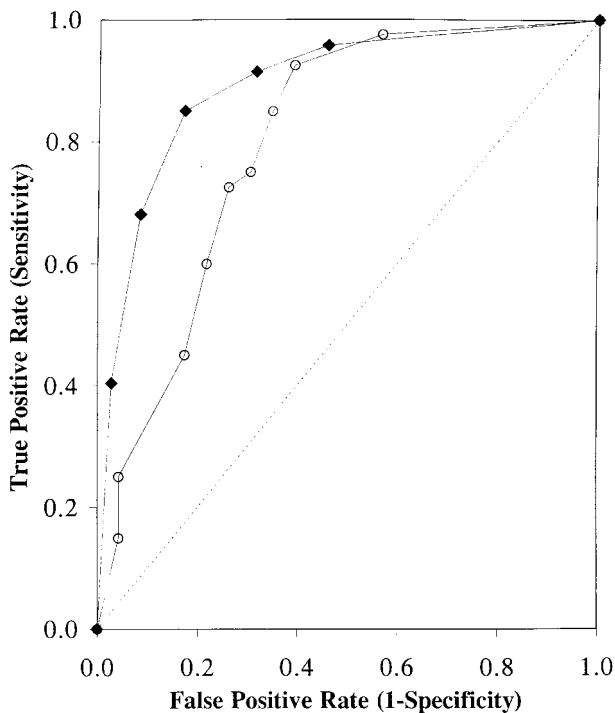
Acknowledgements

Figure 1. Comparison of the Minimum Data Set Depression Rating Scale (◆) and the 15-item Geriatric Depression Scale (○) with an American Psychiatric Association Diagnostic and Statistical Manual, version IV (DSM-IV) diagnosis of depression. - - -, line of no information.

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