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Feature Article

Aggressive behaviour risk assessment tool for long-term care (ABRAT-L): Validation study

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ABSTRACT

This prospective cohort study was conducted to validate the usefulness of the Aggressive Behaviour Risk Assessment Tool for Long-Term Care (ABRAT-L) in predicting aggressive events. A total of 615 newly admitted residents at 22 long-term care homes in Canada were included. The risk of aggression was assessed using the six-item ABRAT-L within 24 hours of admission, and incident reports of aggressive events occurring within 30 days of admission were collected. Forty-seven residents out of 615 had one or more aggressive events (7.6%). The receiver operating characteristics analysis of ABRAT-L showed a good discriminant ability at the previously recommended cut-off score of 4, with satisfactory sensitivity and specificity. The usefulness of ABRAT-L in identifying potentially aggressive residents at the time of admission was confirmed. This validation study supports the adoption of a proactive risk assessment tool, ABRAT-L, as a part of routine admission assessments at long-term care homes.

Verbal and physical aggression arising from residents in long-term care homes poses a serious threat to other residents and staff. Aggressive behaviors are of concern because of high prevalence and serious consequences, including fatalities. A summary of 105 fatal incidents identified through an internet search indicated that "push-fall" or head/face "beating" incidents resulting in hip fractures or head/face and brain injuries were the most common events.[1] Almost all (90%) of the exhibitors apparently had dementias. Similarly, a nationwide study in Australia on fatalities related to resident-to-resident aggression also found that almost all had dementias.[2] In the United States, approximately 1.4 million people reside in long-term care homes, and approximately half of them have either Alzheimer's disease or dementia.[3] According to the need-driven dementia-compromised behavior model, aggressive behavior is triggered when a resident's needs are not addressed adequately.[4–6] A simple, easy-to-use tool that can identify residents at risk of aggression before the occurrence of such events could enhance safety for both residents and staff by providing targeted preventive measures.[7] Aggressive behaviors may be preventable if staff can identify such residents and proactively meet their physical and psychological needs in a timely manner.

Background

In the United States, the number of people over the age of 65 is expected to be 88.5 million by 2050, of whom one-fifth will be older than 85.[3] Many elderly people will need long-term care services as the incidence of Alzheimer's disease and other dementias will continue to increase with the ageing population. Relocation into a long-term care home is often necessary and beneficial for some elderly people with cognitive or physical impairments. However, the transition process can be quite stressful to the elderly people, and in extreme cases, Relocation Stress Syndrome can occur. This nursing diagnosis includes defining characteristics of increased confusion, anxiety, and anger associated with relocation.[8–10]

Specifically, the first week of relocation appears to be the most stressful time. According to a randomized controlled trial that included physiological assessments of stress among 116 residents 1 week before, 1 week after, and 4 weeks after relocation to a new long-term care facility, morning salivary cortisol levels were highest during the 1st week of relocation.[11] By the 4th week, the cortisol level started to decrease, indicating "settling in" to the new environment. During this time of adjustment to a new environment, newly admitted residents may experience anger, feelings of abandonment, or confusion, which can trigger physical and verbal aggression directed at other residents as well as staff.[12] In Sentinel Event Alert 59, the Joint Commission suggests the development of a risk assessment tool to identify those with violent tendencies to prevent verbal and physical

Conflict of interest: Lori Young and Brigette Berry are employees of Extendicare Inc. No conflict of interest has been declared by Son Chae Kim.

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aggression.[13] However, there is a dearth of aggressive behavior risk assessment tools that have been validated for predicting future aggressive events among residents in long-term care homes.

Since 1991, the Centers for Medicare and Medicaid Services (CMS) have required regular behavioral assessments for all residents in long-term care homes participating in Medicaid, using a standardized assessment tool, the Resident Assessment Instrument (RAI).[14] The Minimum Data Set, version 3.0 (MDS 3.0), which is a part of the RAI, contains items assessing the presence and frequency of verbal and physical aggressive behaviors. These aggressive behaviors include threatening, screaming, cursing, hitting, kicking, pushing, scratching, grabbing, pacing, throwing, or abusing others sexually. These items are based on a "7-day look-back period" at admission, quarterly, annually, at discharge, or if the resident's status has changed. However, these assessments collect data on aggressive behaviors present during the previous 7-day period, based on staff members' memory, and have not been tested for predicting future aggressive events. Similarly, most of the existing tools for assessing aggressive behaviors have not been validated for predicting future events with satisfactory sensitivities and specificities. These include the Aggressive Behavior Scale (ABS),[15] the Cohen-Mansfield Agitation Inventory (CMAI),[16] the Brief Agitation Rating Scale (BARS),[17] the Ryden Aggression Scale,[18] the Rating Scale for Aggressive Behaviors in the Elderly (RAGE),[19] and the Behavior, Engagement, and Affect Measure (BEAM).[20] In a recent study, the Resident-to-Resident Elder Mistreatment-Staff version (R-REM-S) was developed to collect data on specific incidents of resident-to-resident mistreatment during the previous 2-week period, based on staff recollection, but no sensitivity or specificity were reported.[21]

Sensitivity and specificity evaluations are essential for testing the usefulness of risk assessment tools. For example, the *sensitivity* of an aggression risk assessment tool refers to its ability to correctly predict aggressive residents (true-positive), while *specificity* indicates the tool's ability to correctly predict nonaggressive residents (true-negative).[22,23] Thus, the higher the sensitivity, the lower the false negative, and the higher the specificity, the lower the false-positive. In addition to sensitivity and specificity, predictive values help evaluate the probability of the tool providing correct predictions.[24] *Positive predictive value* (PPV) indicates the proportion of the residents with actual aggressive events correctly predicted by the tool. *Negative predictive value* (NPV) refers to the proportion of the residents without any aggressive events correctly predicted by the tool.

The Aggressive Behaviour Risk Assessment Tool (ABRAT) was initially developed to identify potentially aggressive patients in acute care medical-surgical units, and its usefulness was reported with satisfactory sensitivity, specificity, and interrater reliability in a study of 2063 patients.[25] The simple, easy-to-use, 10-item ABRAT checklist includes aggressive behavioral indicators, such as anxiety, agitation, physically threatening, threatening to leave, shouting, mumbling, or staring, in addition to previous history of physical aggression or mania.[26,27] To examine its utility in long-term care homes, the ABRAT was compared to the Aggressive Behavior Scale (ABS), which was a part of the MDS version 2.0, among 316 newly admitted as well as existing residents in two long-term care homes in Canada.[7] The study indicated that the ABRAT was better for predicting aggressive events than the ABS. A second study was conducted among 724 residents to test the ABRAT for identifying potentially aggressive residents newly admitted to one of 25 long-term care homes in Canada.[28] The study resulted in a shorter, six-item Aggressive Behaviour Risk Assessment Tool for Long-Term Care (ABRAT-L) that showed satisfactory sensitivity and specificity. However, a confirmatory follow-up study was needed to prospectively validate the usefulness of the ABRAT-L before widespread adoption as an admission screening tool in long-term care homes.

Aim

The primary aim of this study was to validate the usefulness of the Aggressive Behaviour Risk Assessment Tool for Long-Term Care (ABRAT-L) in predicting aggressive events among newly admitted residents. The secondary aims were to assess the time course of the first aggressive events following admission and explore whether assessments over three shifts is superior to a single assessment during a day shift in predicting aggressive events. In this study, aggressive events were defined as physical aggression, verbal aggression, or sexual harassment.

Methods

Design and participants

A prospective cohort study design was used. Eligible subjects were all residents who were newly admitted to one of 22 long-term care homes located in the Canadian provinces of Alberta, Ontario, and Saskatchewan between June 2017 and December 2017. All newly admitted residents were to be assessed for risk of aggression using the ABRAT-L within 24 hours of admission. Aggressive events occurring within 30 days after admission were captured. Any residents who were discharged or transferred within 30 days were excluded from the study.

Instrument

In this study, the ABRAT-L, incident reports, and demographic variables, including age, gender, admission date, and dates of aggressive events, were collected. In a previous exploratory study among 724 long-term care residents, the six-item ABRAT-L showed satisfactory sensitivity and specificity of 56.6% and 90.8%, respectively, at the recommended cut-off score of 4.[28] The items that comprise the ABRAT-L include age less than 85 years, history of physical aggression, confusion/cognitive impairment, anxiety, physically aggressive/threatening, and threatening to leave. It was also recommended to use weighted summation scores by assigning multipliers of 2 to items of history of physical aggression and physically aggressive/threatening, while a score of 1 was assigned to the remaining four ABRAT-L items. The total ABRAT-L summation score ranges from 0 to 8, with a higher score indicating a higher risk of aggression. An ABRAT-L score of 4 or greater is considered to represent a high risk of aggressive events, while ABRAT-L scores of 1–3 denote an intermediate risk of aggressive events.

Data collection procedures

In preparation for the study, Extendicare study investigators held teleconferences with directors of care and key personnel from each of the 22 participating long-term care homes to discuss the study and review the data collection process. Key personnel from each study site were responsible for ensuring timely completion of the ABRAT-L by their staff, providing follow-up education at the site, and transmitting the collected data to the study investigators on a monthly basis. During the data collection period, key personnel at each study site maintained close communication with the study investigators and received corrective feedback to improve the data collection process.

Upon admission, each resident was assessed by nursing staff for potential aggressive behavior using the ABRAT-L, based on direct

observations, as well as collection of information from medical records and family members. ABRAT-L assessments were repeated over subsequent shifts for a total of three assessments to cover the first 24-hour period following admission. Aggressive events occurring within 30 days of admission were captured using incident reports, according to the standard operating procedure of each study site. Aggressive events directed against other residents or staff, including physical aggression, verbal aggression, or sexual harassment, were collected.

Ethical considerations

This prospective study was reviewed and approved by the university institutional review board. A waiver of signed informed consent was granted, because aggressive residents are unlikely to consent to a study that attempts to identify them as being aggressive, and cognitively impaired residents cannot give informed consent. In addition, the ABRAT was already being used as a part of routine nursing admission assessment at most of the participating long-term care homes.

Data analysis

Descriptive statistics of frequencies and percentages were used to summarize the sample characteristics, the post-admission days of first aggressive events, and the fraction of residents with aggressive events for various ABRAT-L scores. Residents with or without aggressive events were coded as a dichotomous variable (1 = aggressive event; 0 = no aggressive event). The receiver operating characteristics (ROC) analyses were performed to calculate the discriminant ability of ABRAT-L, as well as sensitivities and specificities at various cut-off scores.[29,30] The area under the ROC curve (AUC) of 1.0 indicates perfect discriminant ability, whereas an AUC of 0.5 indicates no discriminant ability.[31,32] SPSS Statistics, version 25.0 (IBM, SPSS Statistics, Armonk, NY), was used in all data analyses, and the level of significance was set at p value < 0.05.

Results

Sample characteristics and aggressive events

Of the 615 newly admitted residents during the study period, 47 residents exhibited aggressive events within 30 days of admission (7.6%). Table 1 shows the sample characteristics. Among all residents, a majority were 85 years or older (52.0%), female (61.5%), and exhibited confusion/cognitive impairment (53.8%). Among the 47 residents with aggressive events, a majority were younger than 85 years of age (66.0%), male (55.3%), and exhibited confusion/cognitive impairment (85.1%) as well as physically aggressive/threatening behavior (61.7%).

Twenty-eight of the 47 residents with aggressive events (59.6%) engaged in one or more physically aggressive behaviors, such as grabbing, twisting arms, biting, hitting, throwing/breaking items, scratching, pinching, punching, pushing, pulling, and striking. Only one resident exhibited sexual harassment (2.1%), whereas 18 residents had verbally aggressive events (38.3%). Some of these aggressive events were directed against nursing staff while resisting care or refusing medications. Only two residents had aggressive events directed against another resident in this study.

Time course of the aggressive events

Fig. 1 shows the number of residents engaging in their first aggressive events within 30 days of admission. Of the 47 residents with aggressive events, 24 residents (51.1%) exhibited their first events either on the day of admission (25.5%) or the next day (25.5%). By the end of the 6th day after admission, 13 additional residents (27.7%) had aggressive events. Thus, 78.7% of the aggressive residents exhibited their first aggressive events within 1 week of admission. In the subsequent 24 days, the remaining 21.3% of the aggressive residents exhibited their first aggressive events.

Validation of the ABRAT-L in predicting aggressive events

Of the 615 residents, 11 (1.8%) were excluded from the validation analyses because their first aggressive events occurred before the completion of the ABRAT-L, resulting in 604 evaluable residents. For the primary analysis using the ABRAT-L data collected over three shifts, the area under the ROC curve (AUC) in ROC analysis was 0.881 (95% confidence interval [CI] 0.830–0.932; $p < 0.001$) (Fig. 2A). The sensitivity and specificity of the ABRAT-L at the recommended cutoff score of 4 were 55.6% and 94.2%, respectively (Table 2). The positive predictive value (PPV) and negative predictive value (NPV) at the cut-off score of 4 were 37.7% and 97.1%, respectively. At an alternate cut-off score of 3, the sensitivity and specificity were 72.2% and 85.2%, respectively, while PPV and NPV were 23.6% and 98.0%.

To address the question of whether a single-shift collection of the ABRAT-L alone is sufficient, a secondary analysis was performed. The AUC in ROC analysis was 0.857 (95% confidence interval [CI]

Table 1
Sample characteristics and ABRAT-L items ($N = 615$).

	All ($N = 615$) n (%)	Aggressive residents ($n = 47$) n (%)	Aggressive-event rate (%)
Age categories, years			
< 65	55 (8.9)	8 (17.0)	14.5
65–74	67 (10.9)	2 (4.3)	3.0
75–84	173 (28.1)	21 (44.7)	12.1
≥ 85	320 (52.0)	16 (34.0)	5.0
Gender			
Male	237 (38.5)	26 (55.3)	11.0
Female	378 (61.5)	21 (44.7)	5.6
ABRAT-L items			
History of physical aggression	51 (8.3)	17 (36.2)	33.3
Age, less than 85 years	292 (47.5)	31 (66.0)	10.6
Confusion/cognitive impairment	331 (53.8)	40 (85.1)	12.1
Anxiety	126 (20.5)	23 (48.9)	18.3
Physically aggressive/threatening	39 (6.3)	29 (61.7)	74.4
Threatening to leave	35 (5.7)	9 (19.1)	25.7

Note. Overall aggressive event rate = 7.6%.
ABRAT-L: Aggressive Behaviour Risk Assessment Tool for Long-Term Care.
Percentages may not add up to 100% due to missing data or rounding.

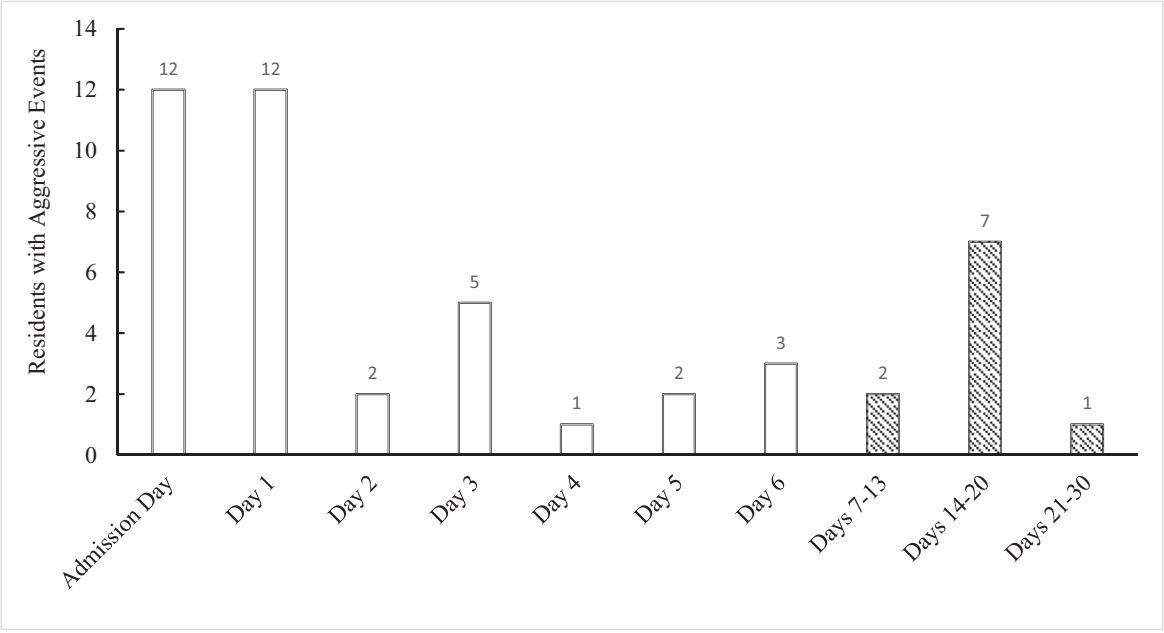

Fig. 1. Time course of the first aggressive events ($n = 47$). *Note.* White bars represent the number of residents with aggressive events during the first 7 days of admission. The cross-hatched bars represent the number of residents with aggressive events during subsequent weeks.

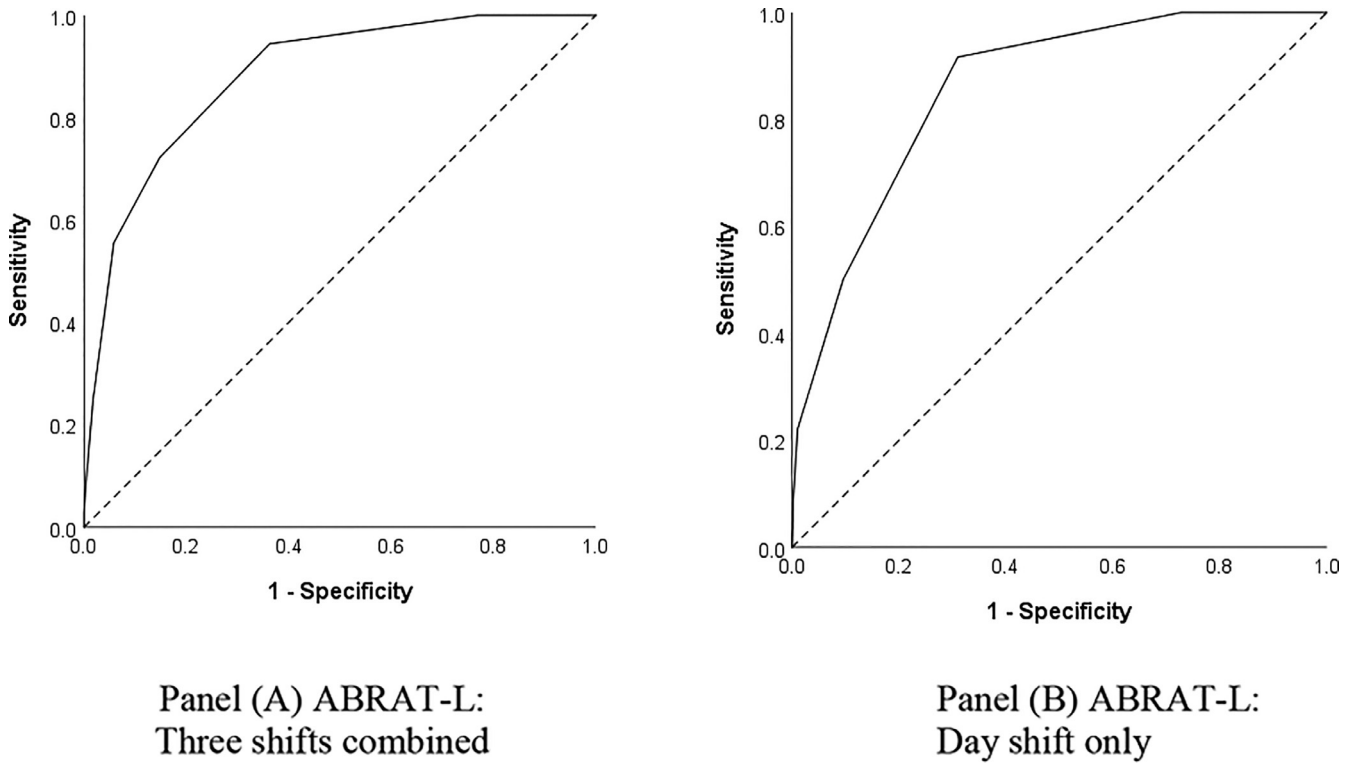

Fig. 2. Receiver operating characteristics (ROC) analysis of ABRAT-L ($n = 604$). *Note.* ABRAT-L: Aggressive Behaviour Risk Assessment Tool for Long-Term Care. Diagonal broken line represents the line of no discrimination with AUC (area under the curve) of 0.5. Panel (A) represents ABRAT-L collection for three shifts. Solid curve in Panel (A) represents the ABRAT-L with AUC of 0.881 (95% CI 0.830–0.932; $p < 0.001$). Panel (B) represents ABRAT-L collection for day shift only. Solid curve in Panel (B) represents the ABRAT-L with AUC of 0.857 (95% CI 0.804–0.909; $p < 0.001$).

0.804–0.909; $p < 0.001$) (Fig. 2B). The sensitivity and specificity of the ABRAT-L at the cutoff score of 4 were 22.2% and 98.9%, respectively (Table 2). The PPV and NPV were 57.1% and 95.3%, respectively. At an alternate cutoff score of 3, the sensitivity and specificity were 50.0% and 90.5%, respectively, while the PPV and NPV were 25.0% and 96.6%.

Fig. 3 shows the percentage of residents with aggressive events by ABRAT-L scores collected over three shifts. A total of 20 out of 53 residents (37.7%) with ABRAT-L scores of 4 or greater had an aggressive event, whereas only 16 out of 551 residents (2.9%) with ABRAT-L scores of less than 4 had an aggressive event.

Table 2
Characteristics of the ABRAT-L over three shifts combined vs. day shift only (n = 604).

Cutoffs	ABRAT-L: Three shifts combined		ABRAT-L: Day shift only	
	Sensitivity	Specificity	Sensitivity	Specificity
2	94.4%	63.7%	91.7%	69.0%
3	72.2%	85.2%	50.0%	90.5%
4	55.6%	94.2%	22.2%	98.9%
5	25.0%	98.2%	8.3%	99.8%

Note. ABRAT-L: Aggressive Behaviour Risk Assessment Tool for Long-Term Care.

Discussion

It was an unexpected finding that approximately half of the first aggressive events occurred either on the day of admission or the next day, and more than three-quarters of the events occurred within one week of admission. However, this finding is consistent with a previous study, which found that the most stressful time for residents moving into a new facility is the first week of transition, as shown by their elevated salivary cortisol levels during this period.[11] As newly admitted residents experience varying degrees of relocation stress during the transition period, such initial stress responses can manifest themselves as verbal or physical aggressive behaviors.[33] Therefore, the availability of a brief assessment tool for quickly identifying potentially aggressive residents at the time of admission could allow for an early implementation of targeted, preventive interventions, thereby reducing aggression-related consequences. Nursing staff can play a significant role in this process of identifying and assisting high-risk residents through a better understanding of the transition and adaptation processes.[34,35]

In the current study, the ABRAT-L was completed over three shifts, which improved ABRAT-L performance compared with a single-shift assessment only. Following the initial completion of the six-item ABRAT-L, continued observations over the subsequent two shifts involved the completion of only four items because two other items did not change (i.e., history of physical aggression and age less than 85 years). During the transition period, "sundowning" can occur in elderly residents, with symptoms of increased confusion, agitation, or anxiety during the evening or night shifts, which can trigger aggressive behaviors.[36-38] Therefore, continued observations of the ABRAT-L over three shifts would help capture changes in resident status that may vary according to circadian rhythm.

This prospective validation study indicates that the six-item ABRAT-L is useful for identifying potentially aggressive residents at the time of admission and could be adopted as a part of the admission screening process in long-term care homes. The AUC from ROC analysis in the current validation study was 0.881, which confirms the previous AUC of 0.804. At the recommended cutoff score of 4, the sensitivity and specificity of 55.6% and 94.2% were similar to those from the previous exploratory study. This sensitivity and specificity indicate that the ABRAT-L would correctly identify more than half of the aggressive residents (true positive) and almost 95% of the nonaggressive residents (true negative). On the other hand, the ABRAT-L would miss about 45% of the aggressive residents. The positive predictive value of 37.7% indicates that more than one-third of residents with ABRAT-L scores of 4 or higher will be aggressive, whereas the negative predictive value of 97.1% indicates that among the residents with ABRAT-L scores of less than 4, almost all of them will be nonaggressive.

For a higher sensitivity, an alternate cutoff score of 3 could be considered. At this cutoff score, the sensitivity and specificity would be 72.2% and 85.2%, respectively. Although almost three-quarters of aggressive residents would be correctly identified by the ABRAT-L, this would come at the cost of a greater number of residents being falsely identified as potentially aggressive (14.8%). Therefore, either cutoff score of 3 or 4 could be justified, depending on the tradeoff between higher sensitivity and higher specificity.

Among residents with dementia, non-pharmacological person-centered care has been recommended by the Alzheimer's Association to reduce agitation and aggression.[39] The person-centered care involves understanding the individual and devising care to meet the needs of the person rather than that of the organization or staff. However, a meta analysis of several randomized controlled trials of person-centered care intervention in long-term care homes reported inconsistent effects on reducing agitation or aggression.[40] A targeted application of such intervention to high-risk residents as assessed by ABRAT-L may result in more reliable efficacy. Robust randomized controlled trials of high-risk residents are needed to evaluate the effects of such targeted interventions on aggressive events.

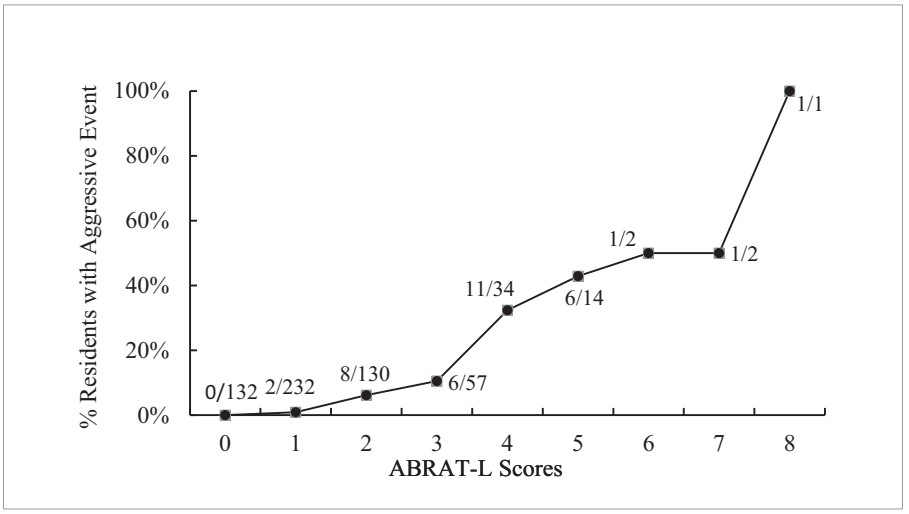

Fig. 3. Percentage of aggressive residents vs. ABRAT-L scores (n = 604). *Note.* The ratios are of aggressive residents to total residents at various ABRAT-L scores over three shifts combined.

Study limitations

There are certain limitations to this study. The ABRAT-L was not completed before the first aggressive events for 11 residents, resulting in their exclusion from the primary validation analysis, which could have affected the estimations of sensitivity and specificity of the ABRAT-L. In addition, this study was performed in a large number of long-term care homes within a single organization. Thus, generalizability of the study findings to other organizations may be limited.

Conclusion

The availability of a validated risk assessment tool that identify potentially aggressive residents may allow timely implementation of targeted interventions prior to the occurrence of aggressive events. ABRAT-L, a simple and easy-to-use tool, may be considered for adoption as a part of routine assessments for newly-admitted residents at long-term care homes.

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