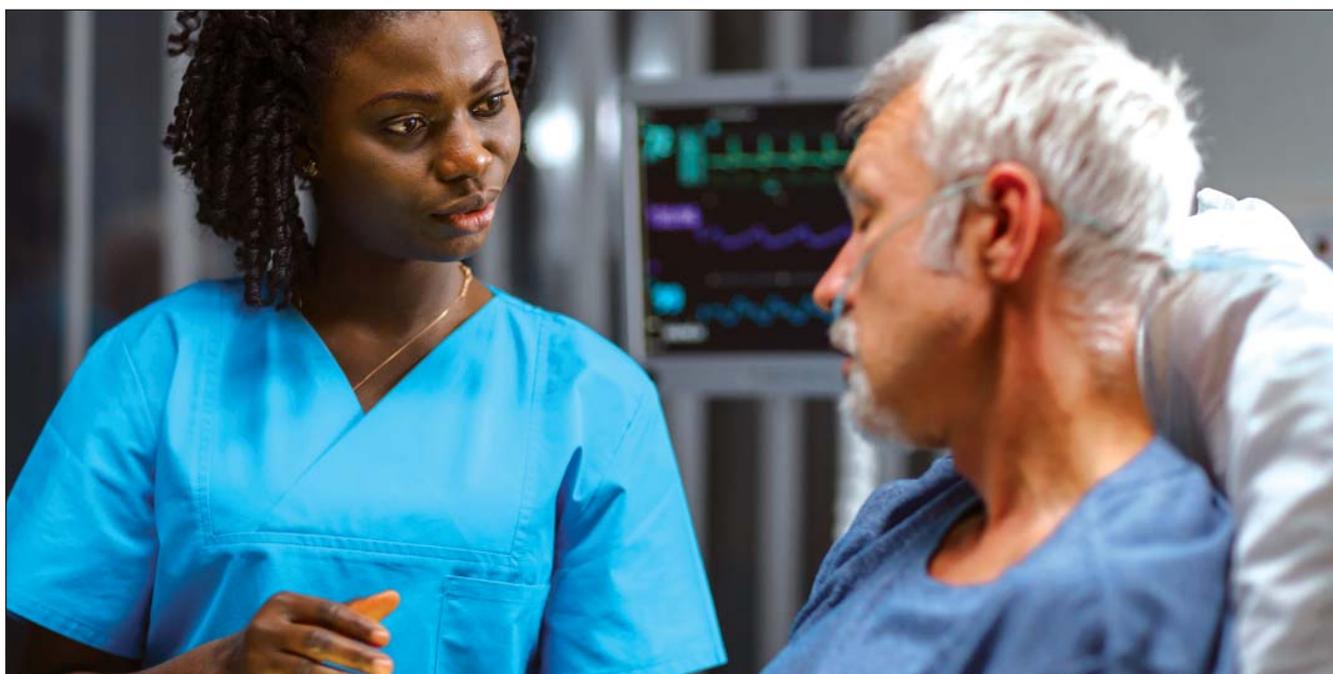# Nurses' Recognition of Hospitalized Older Patients With Delirium and Cognitive Impairment Using the Delirium Observation Screening Scale

A Prospective Comparison Study

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ABSTRACT

The aim of the current study was to report findings about delirium detection when ward nurses screened for delirium in patients with cognitive impairment using the Delirium Observation Screening Scale (DOSS) in comparison to the Confusion Assessment Method (CAM). A secondary analysis was performed of research data collected in 2010 at a Swiss tertiary university hospital. During the first 5 days after admission, patients 70 and older with cognitive impairment were screened for delirium using the DOSS. Throughout patients' hospital stay, research assistants also completed the CAM on a daily basis. A total of 138 patients who did not have delirium initially participated in the study. Of these patients, 44 (32%) developed delirium with a median duration of 3 days (Q1 = 1.25; Q3 = 5.00). Ward nurses correctly identified delirium using the DOSS in 56% of cases (sensitivity) and no delirium in 92% of cases (specificity). Although the DOSS was 100% correct in detecting patients with hyperactive delirium, the identification rate decreased to 60% for patients with mixed delirium subtype and 38% for patients with hypoactive delirium. Delirium screening using observational methods may be insufficiently sensitive and should be supplemented with a formal attention test. [*Journal of Gerontological Nursing, 44*(12), 35-43.]

Wolfgang Hasemann, PhD, RN; Debbie Tolson, PhD, MSc, RGN, FRCN; Jon Godwin, MSc, DPhil(Oxon), CPhys, MInstP, FRAS; Rebecca Spirig, PhD, RN; Irena Anna Frei, PhD, RN; and Reto W. Kressig, MD

Delirium is an acute, severe neuropsychiatric syndrome characterized by disturbances in arousal, attention, and cognition (American Psychiatric Association [APA], 2013). There is a significant association between the development of incident dementia and the worsening of dementia after delirium (Davis et al., 2012; Davis et al., 2017). The non-detection of prevalent delirium in older patients presenting to emergency departments is associated with a 30.8% mortality rate within 6 months, which is double the mortality rate for patients with detected and treated delirium (Kakuma et al., 2003). The hazard ratio for post-discharge mortality is 1.62 in patients who develop delirium during hospitalization compared to patients who do not develop delirium (Witlox et al., 2010). It is assumed that the persistence of delirium symptoms, typically when delirium is overlooked and untreated, is associated with a reduced threshold for new episodes of delirium, thus causing prolonged neuropsychiatric symptoms (Witlox et al., 2010). The reasons for non-detection include lack of systematic delirium screening (Grossmann et al., 2014) and/or the inappropriate use of validated assessment tools (Inouye, Foreman, Mion, Katz, & Cooney, 2001).

Schuurmans, Shortridge-Baggett, and Duursma (2003) were the first to develop a delirium screening scale based on observation and established delirium definitions from criteria of the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; APA, 2000). The Delirium Observation Screening Scale (DOSS) comprises 13 items within seven domains (the number of items per domain is shown in parentheses): consciousness (1), attention/concentration (3), thinking (1), memory/orientation (3), psychomotor activity (3), mood (1), and perception (1). Each item counts as 1 point, with scores ranging between 0 (*cognitively normal*) and 13 (*most severe delirium*). A mean score ≥3 over a 24-hour period indicates delirium. Items were expressed using nurses' conversational language, such as "Dozes during conversation (or activities)" or "Is easily or suddenly emotional." Internal consistency was high (Cronbach's alpha = 0.93 to 0.96) and predictive validity compared with *DSM-IV* criteria or diagnosis by a geriatrician was good (Gemert van & Schuurmans, 2007).

The DOSS is being increasingly used in different settings and in several countries. It has been validated for use in cardiac surgery (Koster, Hensens, Oosterveld, Wijma, & van der Palen, 2009), palliative care (Detroyer et al., 2014), and community hospice patients (Jorgensen, Carnahan, & Weckmann, 2017). It has also been validated in an acute care setting in the United States (Gavinski, Carnahan, & Weckmann, 2016). Currently, validation in British nursing homes is ongoing (Teale et al., 2016). In 2016, the DOSS was implemented in the Delirium Early Monitoring System on a psychogeriatric ward for patients with moderate to severe dementia in northeast England (Rippon et al., 2016).

Despite good performance in the different validation studies of the DOSS, a recent study revealed poor sensitivity of the DOSS in routine daily practice of clinical nurses (Numan et al., 2017). One important characteristic of the study by Numan et al. (2017) was that it was not performed in a center/population for which the instrument was developed. In addition, the study investigated the performance of the DOSS beyond a validation study setting. Therefore, because the current authors had comparable data generated outside a validation study, a secondary analysis of an existing dataset was performed (Hasemann, 2013).

The aim of the current study was to assess the performance of delirium detection based on observation when ward nurses use the DOSS in daily routine practice to screen for delirium in older hospitalized patients with cognitive impairment compared to a structured assessment using the Confusion Assessment Method (CAM; Inouye et al., 1990).

METHOD

Design

The current diagnostic performance study was a secondary data analysis of a larger program of research focused on a newly developed algorithm, DemDel, to prevent and manage delirium in patients with mild to major neurocognitive disorder (i.e., cognitive impairment) (Hasemann, 2013). The program of research comprised a 1-day training session for ward nurses to administer the intervention that focused on delirium prevention, including an intensive systematic screening schedule for cognitive impairment and delirium, as well as comprehensive delirium management (Hasemann et al., 2016). The session comprised interactive teaching sessions with case studies on nonpharmacological measures as well as the appropriate use of antipsychotic medications, role playing, and video examples for training of the assessments.

Setting and Participants

Data were collected in 2010 from four wards of a medical department at a Swiss tertiary university hospital (203 of 669 total beds). Patients were included in the study if they were newly admitted from their own home or a nursing home, were age 70 or older, and showed signs of cognitive impairment (Hasemann et al., 2016). Cognitive impairment was defined as a score of <27 (of 30) on the Swiss version of the Mini-Mental State Examination (SMMSE; Monsch et al., 1995) or <4 (of 7) points for the Swiss version of the clock drawing test (CDT; Thalmann et al., 2002). Patients were excluded if they were: (a) aphasic; (b) non-native speakers of German; (c) visually or hearing impaired; (d) in an advanced terminal illness state, stuporous, or comatose;

(e) delirious on admission or experiencing symptoms due to the withdrawal of alcohol or benzodiazepine agents; (f) ill with a neurological disease, such as stroke or seizures; and/or (g) admitted to an oncology service.

Measures

The primary outcome was the development of delirium, which was diagnosed with the short version of the CAM, which comprises four items, to rate the following criteria: (a) acute onset and/or fluctuating course; (b) inattention; (c) disorganized thinking; and (d) altered level of consciousness. All items were rated dichotomously as either *absent* or *present*. The CAM algorithm for the diagnosis of delirium required both the first and second and either the third or fourth criteria to be present. To increase the sensitivity of the current study, the "or" option was used for the first criterion (acute onset and/or fluctuating course) (Inouye, 2003). When 1,071 pooled datasets with CAM assessments were validated against the diagnoses of experts (i.e., geriatricians, psychiatrists, neuropsychologists, and advanced practice nurses), the sensitivity of the CAM was 94% (95% confidence interval [CI] [0.91, 0.97]) and the specificity was 89% (95% CI [0.85, 0.94]), using *DSM-III*, *DSM-IIIR*, *DSM-IV*, or *International Classification of Diseases*, tenth revision criteria (Wei, Fearing, Sternberg, & Inouye, 2008). In patient samples with a higher proportion of dementia, specificity was lower (0.63 to 0.84) (Laurila, Pitkälä, Strandberg, & Tilvis, 2002). The rating of the CAM was based on a structured interview with the SMMSE, the comprehension subtest of the Cognitive Test for Delirium (Hart et al., 1996), and the Digit Span Test (Leung, Lee, Lam, Chan, & Wu, 2011) in the current study to measure inattention. To rate delirium subtype, the motor subscale of the Delirium Rating Scale Revised 98 (DRS-R-98) was used (Trzepacz, Baker, & Greenhouse, 1988).

The secondary outcome was the development of delirium subtype. Patients were classified as having *hypoactive delirium* if the psychomotor item scores were consistent for "motor retardation," and as having *hyperactive delirium* if scores were consistent for "motor agitation." All other variants were classified as *mixed delirium*. Patients were stratified into four different delirium risk groups using the approach of Inouye, Viscoli, Horwitz, Hurst, and Tinetti (1993). The following criteria contributed to delirium risk: an abnormal blood urea nitrogen/creatinine ratio ≥18 (Inouye et al., 1993); vision impairment (i.e., corrected binocular near vision worse than 20/70 as measured by the bedside Jaeger vision test) (Bates & Bickley, 1999); illness severity score >16 on the Acute Physiology and Chronic Health Evaluation (Knaus, Draper, Wagner, & Zimmerman, 1985); and cognitive impairment as described above. Cognitive impairment was measured with the SMMSE and CDT. Comorbidity was measured with the Charlson Comorbidity Index (Charlson, Pompei, Ales, & MacKenzie, 1987).

Data Collection

Research assistants assessed patients on a daily basis using the CAM and DRS-R-98. In addition, a chart review was undertaken, and nurses' and physicians' notes were screened for descriptions of delirious behavior such as fluctuation of symptoms. CAM assessments were conducted before ward nurses' DOSS scores were collected.

Statistical Analysis

Analyses of frequencies or measures of central tendency were performed using SPSS version 19 for descriptive statistics. Descriptive variables were scrutinized with the Kolmogorov-Smirnov test. Normally distributed descriptive data were reported with mean scores and standard deviations; non-normally distributed data were reported as medians with 25th (Q1)

and 75th (Q3) percentiles. Binary classifiers, such as sensitivity or specificity, were calculated using R version 3.2.1 to calculate 95% CI and the diagnostic accuracy with the area under the curve (AUC) analysis. Exact binomial confidence limits were calculated for sensitivity, specificity, and positive and negative predictive value according to Collett (1999). The CI for positive and negative likelihood ratios is based on formulae provided by Simel, Samsa, and Matchar (1991). To compare ward nurses' DOSS scores with research assistants' CAM assessments, the highest DOSS score per day was compared with the dichotomous CAM result (delirium *yes/no*). A cutoff score ≥3 of 13 on the DOSS was used to determine whether patients had delirium. If a DOSS was not completed on a given day, that day was excluded from calculations of DOSS performance.

Ethical Considerations

Cognitive competence was an important issue in the current research, as the ability to consent declines with progression of cognitive impairment (Okonkwo et al., 2008). An initial informal conversation was started in which patients were asked about their understanding of their current situation. Further, patients were asked to sign the informed consent after the first assessment. This approach was intended to provide better understanding of the consequences that arose from being involved in the study (Hasemann, 2013). If patients demonstrated signs of disorientation with regard to their situation, they were considered incompetent. In these cases, patients' family members were asked to state whether patients' participation in the study would comply with their presumed wishes. Family members then signed the written proxy informed consent, as approved by the local ethics board (Hasemann, 2013).

RESULTS

From January to August 2010, 138 patients age 70 and older with

TABLE 1

PATIENT CHARACTERISTICS (*N* = 138)

Characteristic	Value
Gender (*n*, %)	
Female	76 (55.1)
Male	62 (44.9)
Mean age (years) (*SD*) (range)	81.8 (6.3) (70 to 98)
Length of hospital stay (days) (median [Q1; Q3])	10.3 (7; 14.6)
Initial SMMSE score (median [Q1; Q3] [range])	22 (20; 25) (1 to 29)
CDT (median [Q1; Q3] [range])	4 (4; 5) (0 to 7)
CCI (median [Q1; Q3] [range])	2 (1; 3) (0 to 10)
Age-adjusted CCI (median [Q1; Q3])	5.5 (4; 7)
Delirium risk (median [Q1; Q3])	1 (1; 2)
Delirium risk in patients with diagnosed delirium (median [Q1; Q3])	2 (1; 3)

Note. Q1 = 25th percentile; Q3 = 75th percentile; SMMSE = Swiss version of the Mini-Mental State Examination; CDT = Clock Drawing Test; CCI = Charlson Comorbidity Index.
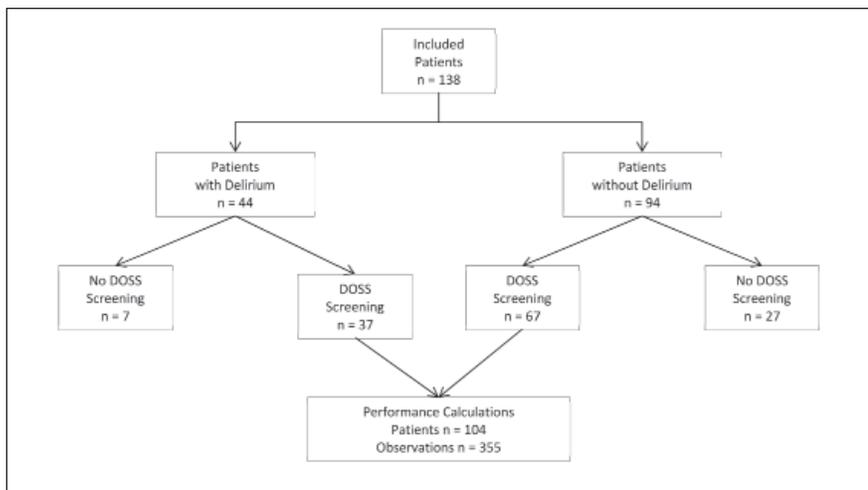

Figure. Nurses' adherence to performance of the Delirium Observation Screening Scale (DOSS).

cognitive impairment were included in the current secondary analysis. Mean patient age was 81.8 years, and 55.1% of patients were female (**Table 1**). Initially, no patients had delirium; however, 44 (31.8%) patients developed delirium with a median duration of 3 days (Q1 = 1.25; Q3= 5.00). Mixed delirium subtype was predominant (61.4%), followed by hypoactive (34.1%) and hyperactive (4.5%) subtypes. Ward nurses administered the DOSS in 104 of 138 patients, which corresponded to an adherence rate of 75.4%. The delirium rate in non-screened patients was 20.6% (seven of 34 patients). As a result, seven (15.9%) of 44 patients with delirium were missed due to nonadherence (**Figure**).

Primary Outcomes

Table 2 shows the performance calculations of completed DOSS screenings in comparison to CAM assessments. On a day-to-day basis in 104 patients, 355 comparisons of ward nurses' DOSS screenings with research assistants' CAM assessments revealed that ward nurses correctly identified delirium episodes in 56% of cases (sensitivity) and no delirium in 92% of cases (specificity). Among bedside nurses' delirium assignments with the DOSS, 73% were classified as having delirium by the CAM (positive predictive value) and 83% of no delirium assessments were confirmed by research assistants (negative predictive value). The probability that bedside nurses classified a patient with delirium correctly was 6.67 times higher than misclassifying a patient without delirium as having the condition (positive likelihood ratio). Conversely, bedside nurses' probability of misclassifying a patient with delirium as not having delirium was 0.48 times lower than classifying a patient without delirium as not having delirium (negative likelihood ratio) (**Table 2**).

Secondary Outcomes

DOSS screenings of patients with hyperactive delirium were 100% correct (AUC = 99.7%); however, the identification rate decreased to 60% in patients with mixed delirium (AUC = 84.8%) and 38% in patients with hypoactive delirium (AUC = 70.7%). Regarding one rating of a patient with hyperactive delirium, the opinion of the research assistants and bedside nurses differed. Research assistants rated the resolved delirium as "no delirium," whereas the bedside nurses labeled the patient as still having delirium according to their DOSS screenings, which led to a specificity of 95% for patients with hyperactive delirium. The specificity in patients with mixed delirium and hypoactive delirium subtypes was 93% in both cases. False scorings (i.e., false negative or false positive scorings) occurred in 5% of patients with hyperactive delirium, 47% of patients with mixed delirium, and

TABLE 2

RESULTS OF NURSES' ASSESSMENTS USING THE DELIRIUM OBSERVATION SCREENING SCALE (DOSS)

Variable	Delirium Subtype (Value [95% CI])			
	Hypoactive	**Mixed**	**Hyperactive**	**Total**
Observations (*n*)	231	305	187	355
Sensitivity	0.38 [0.18, 0.62]	0.60 [0.48, 0.70]	1.00 [0.01, 1.00]	0.56 [0.46, 0.66]
Specificity	0.93 [0.89, 0.96]	0.93 [0.89, 0.96]	0.95 [0.90, 0.97]	0.92 [0.87, 0.95]
Positive likelihood	5.71 [2.72, 12.02]	8.88 [5.28, 14.94]	18.60 [0.97, 1.00]	6.67 [4.28, 10.39]
Negative likelihood	0.66 [0.47, 0.93]	0.43 [0.33, 0.56]	0.00 [0.00, NaN]	0.48 [0.39, 0.60]
Positive predictive value	0.36 [0.17, 0.59]	0.77 [0.64, 0.86]	0.09 [0.00, 0.41]	0.73 [0.62, 0.83]
Negative predictive value	0.94 [0.90, 0.97]	0.86 [0.81, 0.90]	1.00 [0.97, 1.00]	0.83 [0.78, 0.88]

Delirium According to the CAM	Observations (*n*)							
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
DOSS delirium rating = yes	8	14	49	15	1	10	58	21
DOSS delirium rating = no	13	196	33	208	0	176	46	230
Patients (*n*)	12	67	24	67	1	67	37	67

Note. CI = confidence interval; NaN = not a number; CAM = Confusion Assessment Method.

69% of patients with hypoactive delirium. DOSS–CAM comparisons revealed a DOSS score of 0 (i.e., no delirium) among seven (33.3%) of 21 comparisons in patients with hypoactive delirium and 11 (13.4%) of 82 comparisons in patients with mixed delirium.

DISCUSSION

Although nurses' screenings with the DOSS revealed high specificity, the overall sensitivity was low, particularly in patients with hypoactive delirium and partially in patients with mixed delirium. Furthermore, the adherence rate to conduct the screenings was 75.4%, which was lower than expected. Specificity of the DOSS was high overall as well as for subtypes, and the positive likelihood achieved in the total comparison and subtype analysis of values >5 (**Table 2**) is considered clinically useful (Jaeschke, Meade, Guyatt, Keenan, & Cook, 1997). However, with the exception of the hyperactive delirium group, no other subgroup or the total sample achieved acceptable negative likelihood ratios due to false negative DOSS screenings. Furthermore, the low AUC in the hypoactive delirium subgroup revealed that the DOSS has limitations in the prediction of delirium for this patient population.

Concerning the diagnostic performance comparisons, the results of the current study revealed several weaknesses when nurses rated delirium based on observation using the DOSS in patients with cognitive impairment. A global sensitivity rate of 56% is poor, considering that nurses had sufficient time to rate patients' behaviors over a time frame of approximately 9 hours. This finding is consistent with that of a study by Numan et al. (2017), in which only 32% of patients with delirium were detected. The best correspondence between research assistants' CAM assessments and ward nurses' DOSS scores was achieved in patients with hyperactive delirium, and a moderate correspondence was found in patients with mixed delirium. In patients with hypoactive delirium, the detection rate was weak (38%). This result is consistent with findings of Schofield, Tolson, and Fleming (2012), whose critical discourse analysis revealed that "the hyperactive presentation of delirium became for nurses a defining feature of delirium and excluded the equally undesirable hypoactive or 'quiet' presentation" (p. 173). As underdetection occurred mainly in patients with mixed and hypoactive delirium, there might be a systematic problem underlying the poor scores of these delirium subtypes. One problem may be that inattention is difficult to detect without formal assessment, as one third of the DOSS scores were 0 in patients with hypoactive delirium. Patients with hypoactive delirium are characterized as having psychomotor retardation in terms of decreased speed of actions or decreased speech (Meagher et al., 2014). Thus, it is more difficult to detect delirium symptoms in this group of patients. In a content analysis of nursing documentation, Steis (2009) could not detect any pa-

tient with delirium superimposed on dementia (DSD) because nurses did not use the terms "delirium" or "acute confusion" to describe these patients. Instead, they used orientation criteria to describe patients' mental status.

A similar effect was observed in a study that used the Intensive Care Delirium Screening Checklist (ICDSC), an observational delirium screening instrument for critical care

ment of Palmateer and McCartney (1985) that nurses tend to describe patients with cognitive deficits as "having more difficulty with self-care and fewer positive social interactions" (p. 12). Nurses' tendency to label patients with cognitive deficits with descriptions of undesirable behavior is consistent with the observations of Schofield et al. (2012), who described nurses' construction of confused older

difficult to explain why the sensitivity was, at 94.4%, significantly better in the validation study by Schuurmans, Donders, Shortridge-Baggett, and Duursma (2002) than in the current study (56%). One explanation might be the different settings. Interestingly, higher specificity of 92% was obtained in the current study compared to 77% in the study by Schuurmans et al. (2002). This finding may be attributed to the fact that nurses tend to label patients with altered mental status as experiencing dementia rather than delirium or DSD (Day, Higgins, & Koch, 2008). This labeling may explain the high negative predictive values in the hypoactive delirium subgroup of the current study.

The screening adherence rate of 75.4% in the current study is slightly higher than average adherence rates in implementation studies in which systematic screenings were introduced with different scales. Adherence rates in 13 reviewed studies ranged from 14% to 100%, with a median rate of 75% (Trogrlic et al., 2015).

> **The best correspondence between research assistants' Confusion Assessment Method assessments and ward nurses' Delirium Observation Screening Scale scores was achieved in patients with hyperactive delirium...**

patients (van Eijk et al., 2009). Sensitivity for delirium was 43% when nurses used the ICDSC to screen for delirium (van Eijk et al., 2009). When Inouye et al. (2001) investigated nurses' recognition of delirium and its symptoms, they found four independent patient risk factors for underrecognition. The strongest risk factor was hypoactive delirium. In the study by Inouye et al. (2001), nurses rated delirium based only on observation. The poor detection rates for hypoactive and mixed delirium subtypes may therefore be a consequence of relying on observation instead of performing a structured assessment for appraising patient cognitive status. Furthermore, nurses had difficulty in correctly appraising inattention (15%), disorganized thinking (26%), and altered level of consciousness (15%), which are key features of delirium (Inouye et al., 2001). In addition, Inouye et al. (2001) argued that nurses "tend to label patients as delirious when their behavior made them difficult to care for" (p. 2471), following the argu-

adults "as running, moving, and falling bodies" and that "the discursive framings of patients mainly focused on the movement and speed with which they left the confines of the ward" (p. 172).

In addition, as the current sample comprised patients with pre-existing cognitive impairment, there may have been difficulty in differentiating between normal aging, dementia, and DSD. Richardson et al. (2017) stated that the detection of DSD is usually achieved by collateral history. As the DOSS does not rely on collateral history information, there might be a weakness in detecting acute changes in cognition, as this criterion is not part of the DOSS.

Comparing subgroups (i.e., patients with hypoactive and hyperactive delirium), the detection rates were approximately double those found in the study by Fick, Hodo, Lawrence, and Inouye (2007). This improved detection rate may be due to the training sessions that nurses attended in the current study. However, it is

As delirium detection via observation has limitations, the question arises of whether structured delirium assessment (i.e., asking patients questions about their cognitive status several times per day over several days) would provide a better alternative. Richardson et al. (2017) suggested a combined arousal–attention assessment for diagnosing DSD. However, the current evidence reveals that nonadherence rates remain similar when nurses ask structured questions. Leuenberger, Fierz, Hinck, Bodmer, and Hasemann (2017) investigated adherence to an alcohol withdrawal management program and demonstrated that nurses conducted only 50% of the required structured assessments. Nurses had to rate patients' withdrawal symptoms using the Clinical Institute Withdrawal Assessment of Alcohol Scale (CIWA-Ar; Sullivan, Sykora, Schneiderman, Naranjo, & Sellers, 1989). Nurses had to rate patients' tremors or ask patients whether they had experienced hallu-

cinations. Interestingly, some nurses who reported having performed the CIWA-Ar assessments stated that they did not ask patients the questions about hallucinations or tremors as required to avoid confronting patients with offending questions (Soldi, Hasemann, & Frei, 2015). This finding is consistent with research by Agar et al. (2012). It seems that some nurses tend to avoid discussing stigmatized topics with patients. However, regarding the current study, in the interviews with patients in the parent study, patients with cognitive impairment were open to cognitive testing (Hasemann, 2013).

The discussion of the pros and cons of observation versus structured assessment using questionnaires remains inconclusive. On the one hand, the arguments by Schuurmans et al. (2003) to favor delirium detection through observation are weakened by the poor sensitivity of this procedure in real-life situations, as demonstrated by the current study. On the other hand, nonadherence to structured assessments reveals similar gaps. Neither method appears superior to the other. The DOSS is well-designed, reflects *DSM-IV* criteria, and provides a score that allows nurses to demonstrate the fluctuating course of delirium, which is helpful during discussions with other providers, particularly during lucid phases of delirium. The advantage of the DOSS lies in its questions, which closely reflect nurses' usual language. In the case of patients who are calm and/or drowsy, nurses should formally rate core features, such as inattention, to improve their delirium detection. Using the Months Backwards Test to screen for inattention, delirium may be ruled out in less than 30 seconds (Hasemann et al., 2018). A fairly new instrument, the 4AT, seems promising (Bellelli et al., 2014). The 4AT asks four questions regarding patient age, date of birth, place, and current year, and asks the patient to recite the months of the year in reverse order. Features of fluctuation and arousal are based on observation.

In 2016, the 4AT was administered to measure the nationwide point prevalence of delirium in 108 acute and 12 rehabilitation wards of 161 invited wards in Italian hospitals on "Delirium Day," resulting in an adherence rate of 74.5% (Bellelli et al., 2016). It would be interesting to see whether this approach would enhance acceptance for formal screening.

LIMITATIONS

Due to low scores in the hyperactive delirium subgroup, some estimates could not be calculated with great precision, resulting in the nonestimation of the positive likelihood ratio. This ratio would have enhanced the interpretation of the results had it been possible to include patients with more severe dementia in the study. Greater refusals for study participation were experienced from family members of patients with end-stage dementia. Their concern was that the study may be an additional stressor to the already-stressful experience of dementia. Involving patients with cognitive impairment who do not have the capacity to provide informed consent is a well-known challenge inherent in delirium research with the risk of selection bias (Adamis, Martin, Treloar, & Macdonald, 2005; Holt, Siddiqi, & Young, 2008). As a consequence, the reliability of bedside nurses' DOSS scores in patients with severe dementia remains unknown. A further challenge for nurses may have been the ability to differentiate between existing and new cognitive impairment. This inability may have also contributed to the low sensitivity of the DOSS in the current patient sample. In addition, neurology and oncology patients were excluded, as both patient groups had different standard operating procedures on how delirium should be medically managed.

Although the CAM is widely accepted and extensively validated in different settings for assessing delirium, it is not the optimal reference standard to compare the performance of different scales. The optimal standard would have been *DSM-IV* criteria. The CAM performs best when compared to *DSM-IV* criteria (Laurila et al., 2002), which are the basis of the DOSS. Nevertheless, this fact may have contributed to the lower sensitivity in some cases. However, thorough daily assessments using the SMMSE and DRS-R-98 provided a sound, informed basis to rate the CAM.

Interrater reliability was not formally tested; therefore, a potential risk for measurement bias may have occurred. However, research assistants were not allowed to perform ratings independently unless there was agreement of at least 90%.

As the current study was conducted in patients with cognitive impairment, generalization of the results to patients without baseline cognitive impairment is not recommended.

CONCLUSION

The current study sought to compare nurse observations based on the validated DOSS. Findings provide evidence that the DOSS can identify patients without delirium with a specificity of 92% in patients with cognitive impairment. However, the low sensitivity of the detection of mixed and hypoactive delirium and DSD raises the question of whether the addition of a formal attention test to the DOSS could improve sensitivity. Future research should focus on improving the recognition of hypoactive delirium features on an observational basis.

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ABOUT THE AUTHORS

Dr. Hasemann is Head, Basel Dementia Delirium Programme, and Dr. Frei is Head, Practice Development Unit Nursing, Department of Nursing and Allied Health Professions, University Hospital Basel, Basel, Switzerland; Dr. Tolson is Alzheimer Scotland Professor of Dementia, and Director, Alzheimer Scotland Centre for Policy and Practice, University of West Scotland, School of Health, Nursing and Midwifery, Hamilton, Scotland; Dr. Godwin is Reader in Statistics, Glasgow Caledonian University, Institute for Applied Health Research, Glasgow, Scotland; Dr. Spirig is Director, Care and MTTB, University Hospital Zürich, and Institute of Nursing Science, University Basel, Basel, Switzerland; and Dr. Kressig is Chair of Geriatrics, University Basel, and Department Head, University Center for Medicine of Aging Basel, Felix Platter Hospital, Basel, Switzerland.

Address correspondence to Wolfgang Hasemann, PhD, RN, Head, Basel Dementia Delirium Programme, Hebelstr. 2, CH - 4031 Basel, Switzerland; e-mail: wolfgang.hasemann@usb.ch.