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Recognition of Delirium Features in Clinical Practice: Data from the “Delirium Day 2015” National Survey

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Abstract

Background/Objectives

Delirium is underrecognized in clinical practice. The primary aim of the present multicenter study was to compare the ability of nurses to identify delirium features with a standardized assessment. The secondary aim was to identify predictors of missed or incorrect identifications of delirium by nurses.

Design

Point prevalence study in 120 wards across Italy.

Setting

“Delirium Day 2015.”

Participants

Inpatients aged 65 and older (N = 1,867).

Measurements

Participants and nurses were asked specific questions to investigate their perceptions of the presence of delirium features (acute cognitive change, inattention, cognitive fluctuations, impaired arousal). Delirium was identified according to the results of the Assessment Test for Delirium and Cognitive Impairment (4AT), completed by a physician. Comorbidities including dementia, disability, drug treatments, and delirium motor subtype according to the Delirium Motor Subtype Scale were recorded.

Results

Delirium was present in 429 subjects (23%) according to the 4AT. Cognitive fluctuations was the delirium feature that the nurses most often recognized. Nurses’ perceptions of acute cognitive change, cognitive fluctuations, or impaired arousal had 84% sensitivity and 81% specificity for delirium. The nonmotor subtype of delirium was less likely to be recognized (80%) than the hyperactive (97%), mixed (92%), and hypoactive (90%) subtypes. Incorrect perception of delirium was more frequent in subjects with dementia (specificity 64%).

Conclusions

The delirium feature that nurses were best able to recognize was cognitive fluctuations. The nonmotor subtype was associated with a lower recognition rate. Routine observation and registration of delirium features by nurses in clinical practice might be helpful to increase formal diagnosis of delirium.

Delirium is defined as an acute and fluctuating change in cognitive function that is mainly characterized by a disturbance of awareness and attention; is not better explained by a preexisting neurocognitive disorder; and represents the consequence of a medical condition, substance intoxication or withdrawal, or multiple etiologies.[1] Delirium frequently occurs in older adults who are hospitalized for acute illnesses, and it has a poor prognosis in terms of disability, institutionalization, mortality, burden of care, and costs.[2] Notwithstanding this, and despite the existence of standardized and reliable diagnostic instruments, delirium is often underrecognized or misdiagnosed,[3-5] particularly in individuals with dementia.[6,7]

Delirium can be differentiated according to different motor subtypes into hyperactive, hypoactive, mixed, and nonmotor forms.[8] The hypoactive subtype has the highest prevalence but seems to be the most difficult to diagnose.[9,10]

In an Italian survey, health professionals, especially nurses and physical therapists, exhibited limited knowledge of the core features of delirium and were often unable to correctly identify the most challenging conditions, such as hypoactive delirium and delirium superimposed on dementia.[11] Conversely, educational interventions that promoted the use of standardized approaches increased the detection, reduced the occurrence, and improved the outcomes of delirium.[12-15]

The use of a standardized screening instrument for the detection of delirium is one of the most relevant components of the management of this condition. The Confusion Assessment Method (CAM) exhibits greater sensitivity for delirium detection than routine clinical observations by nurses,[16] but it requires specific training of healthcare providers[17]; therefore, different diagnostic instruments have been developed. The Assessment Test for Delirium and Cognitive Impairment (4AT) results in accurate detection of delirium, defined according to standardized clinical criteria, and does not require specific clinical experience or preliminary training of assessors.[18]

On September 30, 2015, The Italian Study Group on Delirium conducted a large surveillance project called “Delirium Day,” which was the first nationwide point prevalence study to assess delirium in older adults who had been admitted to acute and rehabilitation hospital wards across Italy and used the 4AT for delirium detection.[19] The study found a delirium prevalence of 23%, and the most frequent psychomotor subtype was hypoactive. Because previous smaller studies have reported high rates of delirium misdiagnosis in clinical practice, one of the objectives of the project was to compare the ability of nurses to recognize the presence of delirium features in routine clinical care with the use of a standardized assessment. A further objective of the present analysis was to identify potential predictors of missed (false negatives) or incorrect recognition (false positives) of delirium by nurses.

Methods

Four Italian scientific associations (Italian Psychogeriatric Association, Italian Society of Gerontology and Geriatrics, Italian Society of Hospital and Community Geriatrics, Italian Society of Neurology for Dementia) promoted Delirium Day. Delirium Day 2015 was conducted in 108 acute hospital wards across Italy (62 geriatric, 17 neurology, 17 internal medicine, 12 orthopedic wards) and in 12 rehabilitation wards. Further details of the study design have been reported elsewhere.[19] Informed consent was obtained from all participants or from their next of kin for individuals who were severely cognitively impaired. All data were anonymously entered into a web-based database. The Ethics Committee of the IRCCS Fondazione Santa Lucia, Rome (Prot CE/PROG.500) approved the study protocol.

Study Population

Inpatients aged 65 and older who were in the hospital wards and participated in the survey on the index day were included in the study. Coma, aphasia, and end-of-life status were the only exclusion criteria.

Assessment

One or more attending physicians at each hospital ward assessed study participants. Before the index day, all physicians received written instructions regarding the use of all of the assessment instruments. Information was recorded for all participants on demographic characteristics and education; functional status before admission according to Katz activity of daily living (ADL) score (range 0–6, with 0 indicating complete disability)[20]; dementia diagnosis according to the individual's medical records or prescription of acetylcholinesterase inhibitors or memantine before admission; comorbidities according to the Charlson Comorbidity Index, with the exclusion of dementia[21]; polypharmacy, as indicated by the number of prescribed drug classes (including diuretics, antihypertensives, antiplatelets, antiarrhythmics, lipid-lowering agents, antidiabetics, antiulcer medications, antibiotics, benzodiazepines, antipsychotics, antidepressants, anticonvulsants, and acetylcholinesterase inhibitors or memantine); and length of hospital stay.

As part of the assessment, the physician first administered a 5-item perception questionnaire derived from a previous study.[22] The first question assessed the self-perception of mental confusion and was posed directly to the participant: (1) “Have you felt confused in the last 24 hours?” The physician posed the remaining 4 questions to the registered nurse in charge of the participant: (2): “Do you feel that the patient has delirium or is acutely confused?” (acute cognitive change); (3) “Do you feel that the patient is unable to focus or sustain and shift attention when you talk to him/her?” (reduced attention); (4) “Do you feel that fluctuations in cognitive performance are present during the

day?" (cognitive fluctuations); and (5) "Do you feel that his/her arousal level is sometimes impaired during the day (e.g., is he/she is sometimes drowsy)?" (impaired arousal).

In the final section of the assessment, the physician completed the 4AT for all subjects. The 4AT is a 2-minute assessment that addresses four potential signs of delirium: alertness, memory and orientation, attention, and acute change and fluctuating course. The score ranges from 0 to 12, and the presence of delirium was defined according to published data[18] as a score of 4 or greater. For subjects with scores of 4 or greater, the physicians could complete the Delirium Motor Subtype Scale (DMSS)[23,24] to identify different motor subtypes of delirium (hyperactive, hypoactive, mixed, nonmotor). The DMSS includes 11 motor signs of delirium (4 hyperactive signs and 7 hypoactive signs). The hypoactive and hyperactive subtypes were identified according to the presence of at least two hyperactive or hypoactive features, respectively. The mixed and nonmotor subtypes were identified according to the contemporary presence and contemporary absence of features consistent with hyperactive and hypoactive delirium, respectively.[8]

Statistical Analysis

We compared the results of the perception questionnaire with the results of the 4AT. We calculated the sensitivity of the participants' self-perception and the nurses' perceptions in terms of recognizing delirium as the percentages of positive reports for each of the 5 items on the questionnaire among the subjects with delirium. Similarly, we calculated the specificity of each item as the percentages of negative reports for the subjects without delirium and accuracy as the percentages of true positives plus true negatives in the entire sample. The sensitivity, specificity, and accuracy of item combinations were also evaluated to identify the measure of perception with the highest accuracy for 4AT-defined delirium. The sensitivity and specificity of these measures were compared using Pearson chi-square tests according to age group (<80, 80–84, ≥85), sex, years of education (0–5, ≥6), dementia, care setting, disability level (ADL score 6, 2–5, 0–1), comorbidity group (Charlson Comorbidity Index 0–1, 2–3, ≥4), polypharmacy (number of prescribed drug classes 0–3, 4–5, ≥6), and days of hospital stay (0–5, 6–11, ≥12). The sensitivity for the detection of delirium was also compared according to delirium motor subtype.

Two separate multivariable analyses were performed for subjects with and without delirium to evaluate the factors associated with missed delirium recognition (false negatives) and with incorrect delirium recognition (false positives) independent of other potential determinants.

All analyses were performed using SPSS version 24.0 (IBM Corp., Armonk, NY).

Results

On the index day (September 30, 2015), 2,221 individuals were eligible. Of these, 354 did not consent to participate; thus, a sample of 1,867 subjects was included in the study. Of these, 1,154 were from acute geriatrics, 198 internal medicine, 158 neurology, 107 orthopedics, and 250 rehabilitation wards. The mean age was 82.0 ± 7.5, and 58% were female. According to the 4AT assessment, 429 (23%) participants had delirium, and 449 had dementia (24%). The main features of the subjects according to the presence of delirium have been reported elsewhere.[18] Briefly, subjects with 4AT-defined delirium were older, less educated, and more likely to have dementia and disability than those without. The motor subtype of delirium was hyperactive in 59 subjects (14% of delirium cases), hypoactive in 106 (25%), and mixed in 75 (17%). Thirty-five (8%) subjects with delirium were classified as having the nonmotor subtype, and the DMSS was not completed for 154 (36%) participants.

The prevalence rates of positive answers on each item of the perception questionnaire for subjects with and without delirium according to the 4AT are presented in Table 1. Those who reported self-perception of mental confusion in the previous 24 hours accounted for 52% of subjects with 4AT-defined delirium and 20% without delirium. The nurses reported the presence of acute cognitive change for 58% of subjects with delirium and 5% of those without. Cognitive fluctuations, the delirium feature that the nurses most frequently recognized, had a sensitivity of 77%. The nurses reported this feature for only 16% of subjects without 4AT-defined delirium, a specificity of 84%. Overall, the nurses' judgment about the presence of cognitive fluctuations had 82% accuracy in the identification of subjects with and without delirium. Nurse reports of acute cognitive change and impaired arousal had the highest specificity (96% and 90%, respectively) for the detection of delirium.

Table 1. Positive Answer to Single Items of Perception Questionnaire by Delirium Defined According to the Assessment Test for Delirium and Cognitive Impairment (4AT)

Item Number	Item Label	Item Text	Delirium, n = 429	No Delirium, n = 1,438
1	Self-perception	(To the patient) "Have you felt confused for the last 24 hours?"	223 (52)	281 (20)
2	Acute cognitive change	(To the nurse) "Do you feel that the patient has delirium or is acutely confused?"	247 (58)	59 (4)
3	Reduced attention	(To the nurse) "Do you feel the patient is unable to focus or sustain and shift attention when you talk to him?"	306 (71)	175 (12)
4	Cognitive fluctuations	(To the nurse) "Do you feel that there are fluctuations of cognitive performances during the day?"	331 (77)	234 (16)
5	Impaired arousal	(To the nurse) "Do you feel that the patient's arousal level is sometimes impaired during the day (e.g., is sometimes drowsy)?"	278 (66)	146 (10)

The prevalence of item positivity among the total number of subjects with delirium (n = 429) represents sensitivity. The prevalence of item positivity among the total number of subjects without delirium (n = 1,438) represents 1-specificity.

Combinations of several items from the perception questionnaire were then assessed for accuracy in delirium detection (Supplementary Table S1). The report of at least one feature among acute cognitive change, cognitive fluctuations, or impaired arousal had 84% sensitivity and 82% accuracy. The report of at least one indicator among acute cognitive change, cognitive fluctuations, impaired arousal, and inattention had 87% sensitivity and 79% accuracy. The addition of delirium self-perception to any of the four nurse-reported delirium signs increased the sensitivity slightly (90%) and further reduced the accuracy (72%). Considering these data, the report of at least one indicator among acute cognitive change, cognitive fluctuations, and impaired arousal was chosen as a proxy for delirium perception in subsequent analyses.

Sensitivity of delirium perception did not differ significantly according to age group, care setting, or length of hospital stay and was similar in the subjects with and without dementia, disability, or comorbidities (Table 2). Conversely, nurses' ability to recognize delirium was lower for female subjects and differed according to polypharmacy (highest for subjects with ≥6 drug classes prescribed) and motor subtype (highest for hyperactive (97%) and lowest for nonmotor (80%)) (Figure 1). As illustrated in the figure, sensitivity was even lower in subjects for whom the DMSS was not completed (73%). The ability of the nurses to correctly exclude the presence of delirium was lower for subjects aged 85 and older without delirium and for subjects with lower education, dementia, greater ADL

disability, comorbidity, and polypharmacy and marginally lower for subjects with longer hospital stays. This sensitivity did not differ according to care setting (Table 2).

Table 2. Delirium Perception of Nurses (Defined As Positive Answer to the Acute Cognitive Change, Fluctuations, or Impaired Arousal Items of the Questionnaire) by Delirium Defined According to the Assessment Test for Delirium and Cognitive Impairment (4AT): Subgroup Analysis

Characteristic	Delirium, n = 429	P-Value	No Delirium, n = 1,438	P-Value
	n/N (%)		n/N (%)	
Age				
<80	70/78 (90)	.06	88/577 (15)	<.001
80–84	103/117 (88)		58/360 (16)	
≥85	188/234 (80)	–	131/501 (26)	
Sex				
Male	159/180 (88)	.04	118/605 (20)	.84
Female	202/249 (81)		159/833 (19)	
Education, years				
0–5	242/291 (83)	.44	201/880 (23)	<.001
≥6	112/130 (86)		74/547 (14)	
Care setting				
Geriatrics	231/285 (81)	.13	175/869 (20)	.54
Internal medicine	38/42 (91)		33/156 (21)	
Neurology	41/45 (91)		17/113 (15)	
Orthopedics	21/22 (96)		13/85 (15)	
Rehabilitation	30/35 (86)		39/215 (18)	
Dementia				
No	170/202 (84)	>.99	196/1216 (16)	<.001
Yes	191/227 (84)		81/222 (37)	
Activities of daily living, number preserved				
6	50/59 (85)	.99	60/638 (9)	<.001
2–5	99/118 (84)		95/471 (20)	
0–1	212/252 (84)		122/329 (37)	
Charlson Comorbidity Index				
0–1	147/171 (86)	.18	102/578 (18)	.03
2–3	103/130 (79)		76/439 (18)	

Characteristic	Delirium, n = 429	P-Value	No Delirium, n = 1,438	P-Value
	n/N (%)		n/N (%)	
≥4	111/128 (87)		99/421 (24)	
Drug classes, number prescribed				
0–3	76/101 (75)	.02	68/361 (19)	.04
4–5	140/160 (88)		77/481 (16)	
≥6	145/168 (86)		132/596 (22)	
Hospital stay, days				
0–5	146/173 (84)	.30	83/518 (16)	.06
6–11	83/104 (80)		79/397 (20)	
≥12	128/147 (87)		110/508 (22)	

The prevalence of delirium perception in subjects with delirium represents sensitivity in each subgroup. The prevalence of delirium perception in subjects without delirium represents 1–specificity in each subgroup.

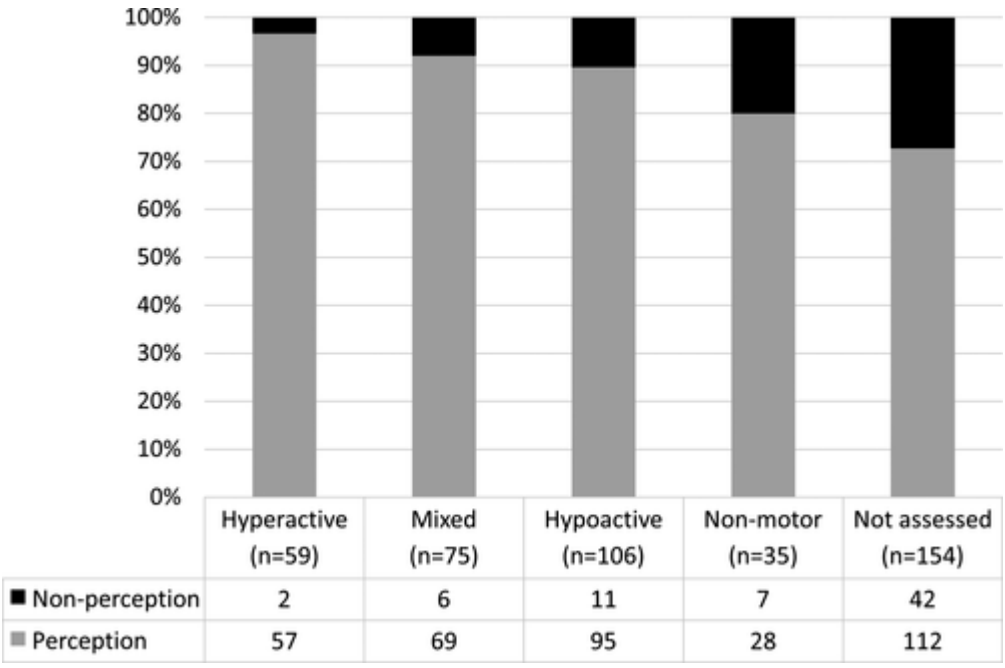

Figure 1. Delirium perception of nurses (defined as positivity to acute change, fluctuations, or impaired arousal) in subjects with delirium according to the Assessment Test for Delirium and Cognitive Impairment (4AT): analysis according to motor subtype. The prevalence of delirium perception represents sensitivity in each subgroup.

In a multivariable model that included subjects with 4AT-defined delirium, missing DMSS data and the nonmotor subtype were independently associated with higher risk of delirium nonperception and a larger number of prescribed drug classes was associated with lower risk (Table 3). Conversely, in subjects without delirium, diagnosis of dementia and lower ADL score were independently associated with incorrect perception of delirium (Table 3).

Table 3. Predictors of Delirium Nonperception of Nurses in Subjects with Delirium Defined According to the Assessment Test for Delirium and Cognitive Impairment (4AT) (False Negatives) and of Delirium Wrong Perception of Nurses in Subjects without Delirium (False Positives): Results of Logistic Regression Models

Predictor	Odds Ratio (95% Confidence Interval)	P-Value
Delirium nonperception		
Age	1.020 (0.977–1.065)	.36
Female	1.770 (0.978–3.204)	.06
Number of drug classes	0.831 (0.728–0.949)	.006
Delirium Motor Subtype Scale (reference hyperactive)		
Missing	10.078 (2.336–43.482)	.002
Nonmotor	5.840 (1.117–30.543)	.04
Hypoactive	3.075 (0.652–14.497)	.16
Mixed	2.416 (0.465–12.549)	.29
Delirium wrong perception		
Age	1.016 (0.996–1.036)	.12
Education, years	0.981 (0,942–1.021)	.35
Hospital stay, days	1.005 (0.999–1.012)	.12
Charlson Comorbidity Index	1.036 (0.984–1.092)	.18
Dementia	2.009 (1.423–2.837)	<.001
Activities of daily living	0.790 (0.740–0.842)	<.001

Discussion

In this large sample of older inpatients, the ability of nurses to correctly identify delirium mainly depended on their ability to appreciate daily cognitive fluctuations. The recognition of impaired arousal had the greatest specificity for delirium defined according to the 4AT. In subjects with the nonmotor subtype of delirium, the recognition rate was significantly lower. A diagnosis of dementia and preexisting disability were associated with incorrect perception of delirium features in subjects without delirium.

The ability of nurses to correctly recognize delirium was higher than in a previous point prevalence study that used the same questionnaire, in which 64% of delirium cases were correctly recognized.[22] The difference was even greater compared with studies that used the CAM for the formal assessment of delirium, which have reported correct recognition rates of only 25% to 30% in routine clinical practice,[16,25] although major differences between previous studies and the present study might explain the different results. In the previous studies,[16,25] bedside CAM rating was used as a measure of delirium recognition, whereas in the present study, the recognition of any delirium feature among acute cognitive change, cognitive fluctuations, and impaired arousal was used as the measure of delirium perception. This approach clearly lowers the threshold for delirium recognition compared with a formal assessment. In fact, different scoring methods for the CAM have produced large differences in the ability to detect delirium in clinical practice. In a previous study, sensitive scoring of the CAM (which requires the presence of acute onset *or* fluctuations of mental changes) was associated with greater sensitivity for delirium (67% vs 24%) than specific scoring (which requires the presence of acute onset *and* fluctuations of mental changes).[26] Moreover, the absence of acute cognitive change, cognitive fluctuations, and impaired arousal was 80% specific in excluding delirium. The high specificity of impaired arousal is in line with results of recent investigations and seems particularly relevant to the discrimination of delirium from dementia.[27] Impairment in arousal can be detected using simple bedside assessment tools such as the modified Richmond Agitation and Sedation Scale.[28]

The main factor associated with delirium nonrecognition was lack of specific motor features, although sensitivity was still approximately 80%. In contrast to previous studies based on the CAM,[17,25] older age, dementia, and hypoactive delirium were not associated with lack of recognition. The lack of specific motor signs is consistent with the presence of an attenuated delirium syndrome as defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*, although the lack of a formal assessment of this condition prevents us from further testing this hypothesis in the present sample. The fact that physician observations and reports of nurses contributed to motor subtyping, in agreement with the scale, might explain the lower rate of recognition of delirium symptoms in subjects

with missing DMSS assessments. It is conceivable that less accurate delirium assessments by the physicians, as evidenced by the missing data, might have been associated with a lower recognition rate by the nurses.

The specificity of delirium feature recognition was substantially lower in subjects with preexisting dementia, consistent with the well-known challenge of recognizing delirium superimposed on dementia[29] and probably to be expected if the perception of any single delirium sign is considered a proxy for delirium recognition, as was the case in the present analysis; we selected this method to maximize sensitivity.

The strengths of the present study are the large, representative, nation-based sample and the detection of delirium using a simple but validated instrument (4AT). Conversely, clear limitations include the presence of a single observation for each subject and the absence of longitudinal follow-up. Other important limitations were lack of formal validation of the perception questionnaire and absence of strict blinding to the 4AT results because of the logistical restrictions of a real-world study. However, according to the study procedures, the perception questionnaire was completed before the 4AT assessment, so the test results were unlikely to have biased the nurses' observations, although this possibility cannot be completely excluded. Conversely, it is conceivable that the nurses' observations might have informed the completion of some of the 4AT items, especially acute change and fluctuating course, which is consistent with the 4AT (and CAM) algorithms. We feel that this possibility is an inherent limitation of delirium studies and might partially explain the good accuracy of the recognition of this feature for delirium detection; this possibility is also a strength because it underlines the importance of this core observation, which can be easily made in clinical practice. Moreover, the prevalence of dementia might have been underestimated because of the frequent underreporting of the diagnosis in hospital charts, although the observed prevalence was similar to previous findings obtained in an acute care hospital[30], which suggests that no substantial underdiagnosis occurred. Finally, because this study was conducted in a self-selected sample, these results are probably representative of the best ability of the nurses to recognize delirium in routine Italian clinical practice, and the perception of delirium features might have been less accurate in an unselected sample of hospital wards.

Conclusion

Based on the present data, we propose that simple training aimed at increasing the motivation of nurses to observe and record clinical observations related to delirium features in routine practice, especially cognitive fluctuations and impaired arousal, might be an important step toward increasing delirium detection. The simple assessment of

arousal might become part of the bedside evaluation of daily vital signs. Limiting formal delirium assessments to suspected cases according to educated clinical observations might be more acceptable for overloaded nursing staffs than the performance of routine assessments of all older adults and would produce satisfactory outcomes according to our results. Strong delirium awareness of healthcare providers would be critical to the implementation of such a strategy. Future studies should verify whether programs aimed at increasing this awareness in routine clinical practice, including initiatives similar to the Italian Delirium Day, will be able to significantly increase the presently low delirium detection rate.

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A full list of Italian Study Group on Delirium members and of contributors who performed data collection can be found in Supplementary Appendix S1.

Conflict of Interest: The authors have no conflicts

Author Contributions: All authors had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study conception and design: EM, GB, AMor, MM, AB, MTra. Data acquisition: SGS, AMaz, GB. Data analysis and interpretation: EM, FT, SGS, AMaz, MTor, AC, MB, MM, AF, NF, MTra. Drafting of manuscript: EM, FT. Critical revision of manuscript for important intellectual content: SGS, AMaz, MT, AC, MB, MM, AB, AF, NF, MTra, AMor, GB. Statistical analysis: EM. Administrative, technical, or material support: GB, SGS, MM. All authors gave final approval of the manuscript submitted.

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