

## Trigger-tools performance for screening potential hyperactive delirium in older people hospitalized in a Brazilian emergency department

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### Abstract

**Objective:** Assess the performance of trigger-tools in detecting hospitalizations of older patients with potential hyperactive delirium in an emergency department. **Methods:** A cross-sectional study was performed with all patients aged  $\geq 60$  years old hospitalized in the emergency department of a Brazilian teaching hospital in 2018. The screening of potential hyperactive delirium was performed with the following trigger tools: prescription of intra-hospital antipsychotic medicines, codes of the 10<sup>th</sup> International Classification of Diseases (ICD-10) proposal by the 5<sup>th</sup> edition of the Diagnostic and Statistical Manual of Mental Disorders, and trigger-words related to hyperactive delirium registered in medical records by health professionals. The positive predictive value (PPV) was calculated to assess the performance of each trigger tool. **Results:** Most hospitalizations (193/286) were screened by at least one trigger tool, of which 49.2% showed potential hyperactive delirium. ICD-10 trigger tool showed better performance (PPV= 0.71), although the strategy had underestimated the detection of potential cases [2.6% (5/193)]. Despite the performance of intra-hospital prescriptions of antipsychotic and trigger-words had been lower (PPV= 0.69, and PPV= 0.48, respectively), the prevalence of potential hyperactive delirium identified were greater with these methods [30.0% (58/193); and 47.1% (91/193); respectively]. **Conclusion:** The use of trigger tools detected one out three hospitalizations of older people with potential hyperactive delirium. The combination of the strategies may contribute to the recognition of the syndrome in emergency department. Data suggests the screening may be performed by pharmacists in association with multicomponent and interprofessional approaches to improve patient safety.

**Keywords:** Aged, Emergency Service, Hospital, Quality Indicators, Delirium, Patient safety.

### Performance de *trigger tools* para triagem de potencial delirium hiperativo em pessoas idosas hospitalizados em departamento de emergência brasileiro

### Resumo

**Objetivo:** Avaliar o desempenho de termos *trigger tools* na detecção de internações de pacientes idosos com potencial delirium hiperativo em uma unidade de emergência. **Métodos:** Um estudo transversal foi realizado com todos os pacientes com idade  $\geq 60$  anos internados em unidade de emergência de um hospital universitário brasileiro em 2018. A triagem de potencial delirium hiperativo foi feita com as seguintes *trigger tools*: prescrição intra-hospitalar de antipsicóticos, códigos do 10<sup>o</sup> Código Internacional de Doenças (CID-10) proposto pela 5<sup>a</sup> edição do Manual Diagnóstico e Estatístico de Transtornos Mentais, e palavras-chave relacionadas com delirium hiperativo registradas em prontuários médicos por profissionais da saúde. O valor preditivo positivo (VPP) foi calculado para avaliar a performance de cada *trigger tool*. **Resultados:** A maioria das hospitalizações (192/286) foi triada por pelo menos um dos *trigger tools*, das quais 49.2% mostrou potencial delirium hiperativo. O *trigger tool* de CID-10 mostrou uma melhor performance (VPP=0.71), no entanto, essa estratégia subestimou a detecção de casos potenciais [2.6% (5/193)]. Apesar da performance de das prescrições intra-hospitalares de antipsicóticos e palavras-chave ter sido mais baixa (VPP= 0.69, e VPP=0.48, respectivamente), a prevalência de potencial delirium hiperativo identificado foi maior com estes métodos [30.0% (58/193); e 47.1% (91/193); respectivamente]. **Conclusão:** O uso de *trigger tools* detectou uma a cada três hospitalizações de idosos com potencial delirium hiperativo. A combinação das estratégias pode contribuir para o reconhecimento da síndrome em unidade de emergência. Os dados sugerem que a triagem pode ser realizada por farmacêuticos em associação com abordagens multicomponentes e interprofissionais para melhorar a segurança do paciente.

**Palavras-chave:** Idosos, Unidade de Emergência, Hospital, Indicadores de Qualidade, Delirium, Segurança do Paciente.



## Introduction

Delirium, a syndrome characterized by acute changes in attention, awareness, and cognition, is caused by a medical condition that cannot be better explained by a pre-existing neurocognitive disorder.<sup>1</sup> Its etiology is complex and multifactorial, since pharmacotherapy, medical illnesses, healthcare level, medical and/or devices procedures may contribute to develop delirium.<sup>2-5</sup>

Regarding behavioral changes, delirium can be classified into three subtypes.<sup>1</sup> Hyperactive subtype is characterized by a hyperactive level of psychomotor activity that may be accompanied by mood swings, agitation and/or refusal to cooperate with medical care. Hypoactive subtype is characterized by a hypoactive level of psychomotor activity that may be accompanied by slowness and lethargy that approaches the stucco. And yet, there is a mixed level of activity in which the individual has a normal level of psychomotor activity even with disturbance of attention and perception.<sup>1</sup>

Older adult people are at higher risk for presenting delirium when hospitalized at emergency departments (ED).<sup>5</sup> The prevalence of delirium in the geriatric population admitted in the ED ranges from 6 to 38%.<sup>6</sup> However, the syndrome remains underdiagnosed, misdiagnosed, and undertreated in daily clinical practice.<sup>7</sup>

The Society for Academic Emergency Medicine Geriatric Task Force has recommended delirium screening as a key quality indicator for emergency geriatric care.<sup>8</sup> According to Wilson et al.<sup>3</sup>, the 5<sup>th</sup> edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) is the most used diagnostic system upon which a reference standard diagnosis is made. Nevertheless, other delirium screening tools have been developed given the impracticality of using the DSM-5 in many settings.

A scoping review identified 27 delirium detection instruments to identify delirium in the ED.<sup>6</sup> The most used are the Confusion Assessment Method (CAM), its adapted version for Intensive Care Units (ICU-CAM) and DSM-5 criteria, the latter being applied by neurologists, geriatricians, or psychiatrists.<sup>6</sup>

Despite this, the literature presents some barriers to routine delirium surveillance,<sup>9</sup> such as: long time for formal psychiatric assessment for delirium diagnosis,<sup>10</sup> several screening tools that require training and time to be applied,<sup>6</sup> and limitations of the screening methods regarding sensitivity and specificity in different healthcare levels.<sup>4</sup> Therefore, these difficulties may underestimate the delirium syndrome in the ED.

The use of trigger-tools has been showed an effective approach to improve detection of delirium in hospitals.<sup>11-13</sup> A trigger-tool is defined as an occurrence (flag or prompt) easily recognized in the medical record to alert the reviewer over a potential adverse event that may not have been identified.<sup>14</sup>

In this setting, the present study aimed to assess the performance of three trigger-tools (a) in-hospital prescriptions of atypical or typical antipsychotic medicines; b) codes of International Classification of Diseases – 10<sup>th</sup> Revision (ICD-10) proposal by DSM-5, and c) trigger-words recorded in patient medical records) to identify potential hyperactive delirium among older adult patients hospitalized in an ED.

## Methods

### Study design and location

A cross-sectional study was performed through the assessment of medical records of older people admitted to the internal medicine

ward of an emergency department in the interior of São Paulo State (Brazil) in the year of 2018.

### Study population

The inclusion criteria were established according to Raso et al.<sup>15</sup> Thus, all patients aged over 60 years admitted to the internal medicine ward attached to an emergency department in the interior of São Paulo, Brazil, from January to December 2018, were included. Of these, were not included the patients that the length of stay was less than 24 hours; those admitted for elective surgery or underwent surgical procedures during hospitalization; those who received a previous diagnosis of major neurocognitive disorder and/or with a clinical history of cognitive changes; and those who received a prescription for antipsychotics before hospitalization and/or who had to reconcile this pharmacological class during hospitalization. Patients who had a history of addiction to alcohol, tobacco and/or illicit drugs and/or had mental and behavioral disorders due to dependence or withdrawal crisis from these substances were also not enrolled.<sup>15</sup>

The recruitment of eligible hospitalizations and suspected potential delirium was also carried out according to the strategies developed by Raso et al.<sup>15</sup>

- In-hospital prescriptions of antipsychotic medicines:** screening occurred with the identification of at least one in-hospital prescription of typical or atypical antipsychotic medicine, both for administration of time and/or for use when necessary. All dosage forms of haloperidol, levomepromazine, olanzapine, quetiapine, and risperidone available in the emergency department were considered.
- International Classification of Diseases 10<sup>th</sup> Revision (ICD-10):** screening was carried out by identifying at least one of the diagnostic codes proposed by the DSM-5 for the diagnosis of delirium.<sup>1</sup> For screening of delirium associated with clinical or mixed causes and another delirium (specified and unspecified), the codes F05, R41.0, and R45.0 were used, respectively. For causes related to the use of medicines and other substances, the following trigger-tools were used: i) abstinence [F11.23 (opioid); F13.231 (sedative, hypnotic or anxiolytic); F19.231 (other classes)]; ii) intoxication [F11.121, F11.221 (opioids); F13.121, F13.221 (sedative, hypnotic or anxiolytic); F15.121, F15.221 (amphetamine or other stimulant); F19.121, F19.221 (other classes)]; and iii) medication-induced [F11.921 (opioid); F13.921 (sedative, hypnotic or anxiolytic); F15.921 (amphetamine or other stimulant); and F19.921 (other classes)].<sup>1</sup>
- Trigger-words:** the documentation of healthcare professionals in the electronic medical records were screened by identifying trigger-words suggestive of potential delirium. Terms used for the search were as follows: agitation, hallucination, confusion, delirium, disorientation, lethargy, change in mental state, drowsiness,<sup>12</sup> falling asleep, attention, cognition, awareness, difficulty sleeping, decline/depression in the level of consciousness, confusional state, neurocognitive, mental impairment, excessive sleep, and sleep-wake cycle.<sup>1</sup>

After screening, a chart review was performed to confirm the presence of potential delirium, as well as to identify the hyperactive subtype, in addition to assess the patient's pharmacotherapy. The partial review occurred for the potential cases identified by the trigger-words, since only the healthcare professionals' notes which presented the terms of interest were analyzed.



### Data collection and analysis

Thus, data collection was performed in two stages. The first stage included the recruitment of hospitalizations that met inclusion criteria, and the screening of suspected delirium with the proposed trigger-tools. The second stage included total or partial chart review to confirm the potential cases of delirium and identify the hyperactive subtype, age, and comorbidities.

Hospitalizations that were not screened by any trigger-tools were classified as potentially without delirium. In addition, for hospitalizations that trigger-tools were identified, but after chart review the hyperactive delirium was not confirmed, were also classified without delirium.

The assessment of the performance of each trigger-tool in detecting potential cases of hyperactive delirium was performed with the PPV calculation, according to the following equations:

$$\text{PPV potential cases of hyperactive delirium} = \frac{\text{nº of hospitalizations with potential cases of hyperactive delirium detected by the trigger-tool}}{\text{nº of hospitalizations with suspected delirium screened by the trigger-tool}}$$

The PPV calculation was also performed for each trigger-word used for the screening of the healthcare professionals' notes in electronic medical records, as follows:

$$\text{PPV (trigger-word) potential cases of hyperactive delirium} = \frac{\text{nº of times that the trigger-word detected real case of hyperactive delirium}}{\text{nº of times that the trigger-word was identified in the eletronical record}}$$

### Research Ethics Committee

This study was approved by the Research Ethics Committee of the Faculty of Pharmaceutical Sciences of Ribeirão Preto-USP (CEP/FCFRP Protocol nº 505- CAAE: 10303019.7.0000.5403), according to the provisions of the Declaration of Helsinki.

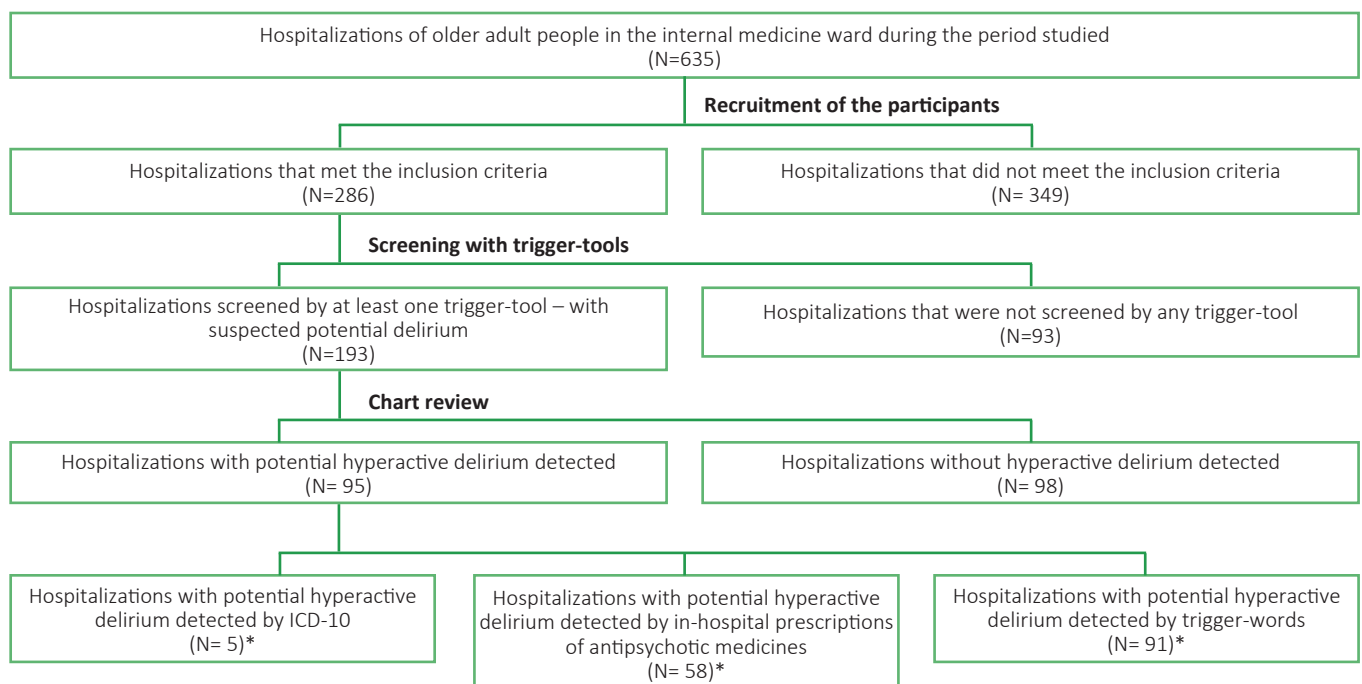
### Results

In 2018, there were 635 hospitalizations of 551 patients recruited from the study ward. The greater number of hospitalizations is explained by the fact that a patient may have been admitted to the institution more than once during the data collection period (1.15 hospitalizations per patient).

Two hundred and eighty-six hospitalizations (45.0%) met the inclusion criteria. Most hospitalizations were related to female patients [50.3% (144/286)], with a mean age of 72.0 ± 7.9 years old. It was found that 4.2% of hospitalizations were related to former smokers, 1.8% to former alcoholics, 1.5% to current smokers, and 0.9% to alcoholics.

At least one trigger-tool was identified in 67.4% (193/286) of hospitalizations. After chart review, potential hyperactive delirium was detected in 49.2% (95/193) of them. There were 191 hospitalizations classified as potentially without delirium, since 93 of them were not screened by any trigger-tools and the other 98 hospitalizations where the trigger-tools were identified, after partial or total chart review no real case of hyperactive delirium was detected (Figure 1). Therefore, the estimated frequency of potential hyperactive delirium in the studied ward was 33.2% (95/286).

**Figure 1.** Flowchart of detection of potential hyperactive delirium in hospitalizations of geriatric patients an emergency unit. Ribeirão Preto, São Paulo, 2018 (n=635)



Legend: \*The sum is greater than 95, since a hospitalization with potential hyperactive delirium may have been detected by more than one trigger- tool.

Individually, codes of ICD-10, in-hospital prescriptions of antipsychotic medicines and trigger-words screened, respectively, 2.4% (7/286), 29.4% (84/286) and 65.7% (188/286) of hospitalizations with suspected delirium. After chart review, potential cases were confirmed in 2.6% (5/193), 30.0% (58/193) and 47.1% (91/193) of them, respectively. Although the ICD-10 trigger-tool showed the best performance (Table 1), only the F05 code was identified in the medical records.

**Table 1.** Performance of trigger-tools in detecting potential cases of hyperactive delirium in older adult patients hospitalized in an emergency unit. Ribeirão Preto, São Paulo, 2018 (n=193).

Trigger-tool	Potential cases of hyperactive delirium N	Detected N	PPV
ICD-10	7	5	0.71
In-hospital prescriptions of antipsychotic medicines	84	58	0.69
Trigger-words	188	91	0.48

Legend: ICD-10: 10th International Disease Code. PPV: predictive positive value. The total of hospitalizations observed in table 1 is greater than 193, since one potential case of hyperactive delirium may have been screened by more than one trigger-tool

The trigger-words “change in mental state”, “neurocognitive” and “mental impairment” were not identified in any hospitalizations. Although the trigger-words “falling asleep”, “cognition”, “lethargy and “excessive sleep” were detected, there was no potential cases of hyperactive delirium confirmed after chart review (Table 2).

**Table 2.** Performance of trigger-words in detecting potential cases of hyperactive delirium in older adult people hospitalized in an emergency unit. Ribeirão Preto, São Paulo, 2018 (n=188).

Trigger-word	Potential cases of hyperactive delirium N	Detected N	PPV
Hallucination	1	1	1.00
Decline/depression in the level of consciousness	1	1	1.00
Confusion	106	75	0.71
Confusional state	10	7	0.70
Agitation	71	49	0.69
Delirium	47	30	0.64
Desorientation	18	10	0.55
Drowsiness	71	25	0.35
Sleep-wake	8	2	0.25
Awareness	118	28	0.24
Difficulty sleeping	25	5	0.20
Attention	29	4	0.14
Cognition	4	0	0.00
Excessive sleep	3	0	0.00
Lethargy	1	0	0.00
Falling asleep	1	0	0.00
Change in mental state	0	0	0.00
Neurocognitive	0	0	0.00
Mental impairment	0	0	0.00

Legend: PPV: predictive positive value. The total of trigger-words detected is greater than 188 hospitalizations, since one potential case of hyperactive delirium may have been screened by more than one term.

## Discussion

In the present study, potential hyperactive delirium was detected by the trigger-tool method in one out of three hospitalizations of older patients. The individual use of each trigger-tool underestimated the prevalence of delirium and decreased the likelihood of causal association. However, the combined use of the strategies allowed the identification of patients with greater vulnerability to develop hyperactive delirium in the EU under study, which were the people aged 80 years or older. It is important to emphasize that health services require accurate delirium data to monitor the impact of initiatives designed to improve detection and prevention of delirium.<sup>19</sup>The World Alliance for Patient Safety advocates the use of ICD codes as indicators of patient safety.<sup>16</sup> This tool can contribute to the detection of potentially preventable adverse events, in addition to being a low-cost and quick-to-apply methodology.<sup>17,18</sup> Despite the potential to follow trends in delirium rates<sup>19</sup> and the high specificity of the ICD-10 to identify delirium,<sup>20</sup> the strategy underreports the occurrence of the syndrome.<sup>20-22</sup>

Our findings are similar to those previously published<sup>20-22</sup> and raise two important issues. The first suggests the difficulty of healthcare professionals in recognizing delirium<sup>7</sup> or the lack of time to reach an official diagnosis.<sup>23</sup> The second includes the absent, inadequate, or non-standardized documentation of this adverse event in the patients’ medical records,<sup>3,11</sup> even though the diagnosis was made at bedside.<sup>24</sup>

It is important to highlight that both situations impair the quality of healthcare, as well as the development of research.<sup>24</sup> The underdiagnosis and inappropriate documentation impaired the individual use of the ICD-10 trigger-tool to identify delirium in hospitalized aged in our study, which resulted in the underestimation of cases. Owing to prevent and minimize the negative impact of these limitations, Inouye et al.<sup>7</sup> suggest the availability of a more logical coding system for delirium and educational measures for physicians about the importance, recognition, risk factors and proper management of this syndrome.<sup>25</sup>

Despite this, healthcare professionals use a wide variety of terms, descriptors, and words to communicate the assessment of mental state changes in medical records, being delirium one of the least used.<sup>11</sup> The literature has described 39 trigger-words that possibly indicate delirium in hospitalized aged.<sup>11</sup> Among all of them, confusion, change in mental state and disorientation demonstrated better performance for the detection of delirium, with different specificities for each.<sup>11,12</sup>

The lack of standardization in the terminology and nomenclature to report potential delirium in medical records may explain the lower performance of trigger-words, once mental status was not a term applied to describe the syndrome in our study. Furthermore, we observed several false-positive trigger-words which were related to the documentation of fluctuating consciousness levels while patients were not delirious. Thus, the presence of a trigger-word in the medical record requires a causal assessment to confirm the syndrome. Even though the presence of key words has identified the highest prevalence of potential hyperactive delirium, it is not possible to conclude that non-screened hospitalizations do not present cases of the syndrome. This limitation, however, does not prevent the use of trigger tools that look for potential cases once it can be used when it is not possible to review all cases. If associated with in-hospital prescriptions of antipsychotic medicines, detection of potential cases of this syndrome may be increased.



International guidelines recommend non-pharmacological interventions as first-line options to manage delirium.<sup>26,27</sup> Prescription of antipsychotic medicines should be considered when a patient with delirium is distressed or considered a risk to themselves or others. Despite the lack of scientific evidence that shows antipsychotics medicines as effective in reducing delirium severity, resolving symptoms, or altering mortality,<sup>28</sup> their off-label use is common in older people.<sup>29</sup>

Prescriptions of antipsychotic medicines were found to be efficient (54% of sensibility), specific (97% of specificity) and had good performance (PPV=90%) in identifying delirium among older patients in palliative care.<sup>13</sup> Differences in methodology, population and setting of the study may explain the lower performance and prevalence of potential cases observed in our research. Nevertheless, in-hospital prescriptions of antipsychotics medicines for older people without a clinical history of dementia or previous mental status changes are a warning signal to monitor the occurrence of suspected delirium in the ED. This may collaborate with appropriateness of treatment, mitigation of risks and prevention of clinical deterioration, which arises from potentially avoidable neurological disorders.

Finally, although we observed overlap of patients with potential delirium detected by each trigger-tool, there were cases identified by only one of the strategies. Therefore, it is recommended the simultaneous use of trigger-tool methods for screening suspected delirium<sup>22</sup> to improve recognition of real cases of the syndrome. The performance findings confirm the need for screening delirium with the three proposed trigger-tools, since those which showed better performance (ICD-10 and in-hospital prescriptions of antipsychotic medicines) detected the lowest prevalence of potential delirium in the older adult people, due to the limitations related to documentation in medical records.

#### Limitations and strengths:

The present study consists of reviewing medical records to identify potential delirium; therefore, their sensitivity is limited compared to methods based on interviews. Furthermore, we did not apply truncation techniques to adapt the trigger-words. Thus, our findings might be underestimated. In addition, we did not carry out the calculations of sensitivity and specificity of the used trigger-tools since chart review was not performed for hospitalizations classified as potentially without hyperactive delirium. Data collection was conducted in a single ED. Given this and the small sample size, the generalizability to other institutions may be limited.

However, the study has strengths that are important for the evolution of the state of the art. Multicomponent and interprofessional strategies are recommended to improve recognition of delirium in older adult patients, provide healthcare assistance to manage the syndrome appropriately, prevent risk factors and contribute to patient safety. Therefore, the trigger-tools are a complementary method that may be associated with current and traditional strategies developed and validated in the emergency department settings. The combination of different approaches may increase the detection of in-hospital hyperactive delirium in older patients without a previous history or neurocognitive disorders and/or dementia.

Besides, the screening of suspected delirium with the ICD-10, in-hospital prescriptions of antipsychotic medicines and trigger-words is an opportunity to raise the involvement of hospital pharmacists in the interprofessional healthcare team, since

they are underutilized for this purpose.<sup>30</sup> This method also contributes to the automation of screening process as it allows the development of computational algorithms<sup>12</sup> and machine learning.<sup>31</sup> These technologies may optimize the routine and time of healthcare staff, decrease the identification of false-positives and support, or collaborate with clinical decision-making.<sup>12</sup>

## Conclusion

The use of trigger-tools to identify potential hyperactive delirium found that one third of hospitalizations of older people presented this syndrome. Although the ICD-10 codes showed the best performance, the cases were underestimated. The data suggest that potential hyperactive delirium was underdiagnosed or not properly reported in the electronic medical records, as recommended by the DSM-5. Thus, the simultaneous screening with in-hospital prescriptions of typical or atypical antipsychotic medicines and trigger-words contributed to improve the recognition of potential delirium in older patients and had no previous diagnosis of neurocognitive disorders and/or dementia.

Therefore, trigger-tools are a complementary method that may be associated with multicomponent and interprofessional strategies for screening, management, and prevention of in-hospital hyperactive delirium in geriatric patients hospitalized in the ED. In addition, the strategy may be considered in automation technologies to optimize the time of the emergency department healthcare staff to recognize this syndrome.

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## Collaborators:

JR; LMC; DAR; MAF; ACZ; HCC; MTH; FR; LRP; FRV contributed to the preparation of the manuscript

## Conflict of interest statement

None.

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