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# Factors predicting delirium among hospitalized older adults in an urban area, Thailand: A prospective cohort study

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## Abstract

**Background:** Delirium is a common but often underrecognized complication in hospitalized older adults. It is associated with poor outcomes, including longer hospital stays, increased mortality, and long-term cognitive decline. While numerous studies have explored factors contributing to delirium, there is a lack of research on the context of older adults in Bangkok, Thailand. Understanding the predictors of delirium is crucial for early detection and prevention, particularly in an urban hospital setting.

**Objective:** This study aimed to determine the incidence rate of delirium and identify factors associated with its development in hospitalized older adults.

**Methods:** A prospective cohort study was conducted in four internal medicine wards of a large urban hospital in Bangkok, Thailand. Data were collected from 168 hospitalized older adults (≥60 years) over a 7-day period following admission. The Confusion Assessment Method (CAM), the Mini-Mental State Examination (TMSE), and the Systemic Inflammatory Response Syndrome (SIRS) scores were used to assess delirium and cognitive impairment. Data were collected between January 2022 and October 2022, and participants were evaluated on Day 1 (24 hours after admission), Day 3, and Day 7 or before discharge. Descriptive statistics and multivariate logistic regression were used to analyze predictors of delirium.

**Results:** The incidence rate of delirium among hospitalized older adults was 20.80%, with 19.00% developing delirium within the first 24-48 hours of admission. Multivariate analysis revealed that cognitive impairment (OR_adj = 7.81, $p$ <0.001), infection (SIRS) (OR_adj = 3.80, $p$ = 0.025), age (OR_adj = 1.09, $p$ = 0.010), and the presence of caregivers prior to admission (OR_adj = 0.11, $p$ = 0.008) were significant predictors of delirium. The model explained 35.30% of the variance in delirium occurrence.

**Conclusion:** This study highlights the high incidence of delirium among hospitalized older adults and identifies key risk factors, including cognitive impairment, infection, age, and the presence of caregivers. Early delirium screening, including the use of the CAM and TMSE, should be integrated into nursing care for delirium prevention. Infection prevention and effective management strategies should also be prioritized to reduce delirium risk.

## Keywords

Thailand; delirium; older adults; hospitalization; risk factors; cognitive dysfunction; urban hospitals; internal medicine

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## Background

Delirium is a serious condition that occurs frequently among older adults during hospitalization, leading to adverse health outcomes such as prolonged hospital stays, the progression of dementia, increased mortality rates, and higher healthcare costs (Banerdt et al., 2021; Chaiwat et al., 2019; Umurca et al., 2022). It is characterized by disturbances in attention and consciousness, resulting in changes to baseline cognitive function that cannot be better explained by a pre-existing or evolving neurocognitive disorder (American Psychiatric Association [APA], 2013). In medical wards, the prevalence of delirium among patients aged 70 years and older ranges from 11% to 42% (Lewis et al., 2017; Umurca et al., 2022), while the incidence rate in geriatric units and internal medicine wards falls between 18% and 35% (Inouye et al., 2014). Despite the increasing occurrence of delirium among hospitalized older adults in medical departments, it often remains unrecognized and undetected in these vulnerable individuals.

A review of the literature highlights the complex interrelationship between predisposing and precipitating factors that contribute to the risk of developing delirium. Predisposing factors include advanced age, gender, and pre-

existing dementia or cognitive impairment (Arbabi et al., 2022; Lewis et al., 2017; Umurca et al., 2022). Precipitating factors include acute illness, dehydration, electrolyte imbalances, polypharmacy, infections, and a lack of social support (Banerdt et al., 2021; Kotfis et al., 2020; Nguyen et al., 2018). Several studies conducted in Thailand have examined factors associated with delirium in older adults. Existing research suggests that cognitive impairment and a Thai Mental State Examination (TMSE) score below 23 are significant predictors of delirium (Kaewsin & Sasat, 2024; Pipanmekaporn et al., 2021; Sitthisarunkul et al., 2023). Additional factors include the presence of Systemic Inflammatory Response Syndrome (Iamrod et al., 2016), hyperlipidemia, respiratory disease, and a history of mental disorders or prior cognitive impairment (Sitthisarunkul et al., 2023). However, most of these studies have primarily focused on older adults in intensive care units, perioperative patients, or those in emergency departments. As a result, delirium risk assessment in hospitalized older adults is not routinely conducted across all hospital units. There is limited research addressing delirium in internal medicine wards within urban hospitals, such as those in Bangkok.

To address this gap, the Roy Adaptation Model (RAM) was applied as the theoretical framework guiding this study (Roy, 2008). The RAM conceptualizes individuals as holistic beings with biological, psychological, and social dimensions, continuously interacting with a changing environment that includes focal, contextual, and residual stimuli. Focal stimuli represent immediate external or internal challenges that influence behavior and perception. Contextual stimuli include background factors that contribute to focal stimuli and impact the individual's response. Residual stimuli refer to lingering sensory inputs that continue to affect cognition, behavior, and personal experiences even after the primary stimulus has subsided. The RAM framework distinguishes between two coping subsystems: the regulator and the cognator. The cognator subsystem encompasses cognitive processes such as memory, attention, learning, critical thinking, decision-making, and defensive responses (Roy, 2008). In nursing practice, assisting individuals in adapting to and coping with these stimuli is essential. To optimize patient care, nurses should assess and manage focal, contextual, and residual stimuli within the RAM framework.

Given the significant associations between predisposing and precipitating factors and delirium, this study integrates the RAM framework and existing literature. Focal stimuli include infection (SIRS), fluid imbalances, and electrolyte disturbances. Contextual stimuli encompass gender, comorbid conditions, polypharmacy, dementia, or cognitive impairment (TMSE ≤23). Residual stimuli consist of social support and occupational status. Therefore, this study aimed to examine the incidence rate of delirium and its predictive factors among older adults in internal medicine wards at a tertiary care hospital in Bangkok, Thailand. The findings will provide valuable insights for developing clinical practice guidelines to improve nursing care for hospitalized older adults and prevent delirium. Understanding the incidence and predictors of delirium in this population will enable nurses and healthcare providers to address modifiable risk factors, enhance monitoring efforts, and deliver more effective gerontological nursing care in urban healthcare settings.

# Methods

### Study Design

This study employed a prospective cohort approach with a predictive design to examine the incidence rate of delirium and the factors influencing its development. These factors included gender, cognitive impairment, infection, fluid and electrolyte imbalance, polypharmacy, comorbidities, and lack of social support among older adults in internal medicine wards at a tertiary care hospital in Bangkok, Thailand.

### Sample/Participants

The study sample consisted of patients aged 60 years or older who were admitted to two male and two female internal medicine wards at a tertiary care hospital in Bangkok, Thailand. The inclusion criteria required participants to be between 60 and 89 years old, hospitalized in an internal medicine ward for more than 24 hours with stable conditions such as good consciousness, no signs of shock, and acceptable vital signs, and without a prior diagnosis of dementia or alcoholism. Additionally, participants needed to have a SIRS score of two or more and be able to communicate. The exclusion criteria included a history of brain surgery, a blood urea nitrogen (BUN) level of 80 mg/dL or higher, and severe illness, such as bradypnea or apnea with respiratory arrest, acute respiratory distress syndrome, or tachypnea. Participants who met the inclusion criteria were selected through purposive sampling.

The sample size was determined using the G*Power analysis program (Version 3.1.9.2) (Faul et al., 2009) for multiple logistic regression analysis. The power analysis was conducted with an α level of 0.05, a test power of 0.80, an a priori effect size of 0.3, and an odds ratio (OR) of 2.45 (Nguyen et al., 2018). Based on these parameters, the calculated sample size was 169. To account for a potential 5% attrition rate, the final target sample size was set at 178. However, during the study, two participants were transferred to the intensive care unit, and seven outliers were removed, resulting in a final sample size of 168 participants.

### Instruments

Demographic and clinical characteristics were collected, including age, gender, marital status, education level, employment status, financial status, living situation, reasons for admission, medical history, comorbid conditions, fluid intake and output, electrolyte levels, and polypharmacy.

The Thai Mental State Examination (TMSE) was used to assess participants' cognitive function. This tool was translated and adapted from the Mini-Mental State Examination (MMSE) originally developed by Folstein and colleagues (Folstein et al., 1975). The TMSE evaluates six domains: orientation (6 points), registration (3 points), attention (5 points), calculation (3 points), language (10 points), and recall (3 points), with a maximum score of 30. A score of 23 or lower indicates cognitive impairment. The TMSE has been validated and widely used in research and clinical practice, with reported sensitivity and specificity values of 82% and 70%, respectively (Muangpaisan et al., 2015). In this study, the Cronbach's alpha reliability coefficient was tested on 30 hospitalized older adult patients, yielding a value of 0.91.

The SIRS criteria were used to identify patients at risk for severe inflammatory responses or sepsis. These criteria are based on physiological and laboratory indicators that suggest a systemic response to infection. The instrument was translated from the English version developed by the American College of Chest Physicians/Society of Critical Care Medicine Consensus Conference (American College of Chest Physicians, 1992). SIRS is defined by the presence of at least two of the following criteria: body temperature above 38°C or below 36°C, heart rate exceeding 90 beats per minute, respiratory rate over 20 breaths per minute, or partial pressure of $CO_2$ below 32 mmHg, and leukocyte count greater than 12,000 or lower than 4,000 per microliter, or with more than 10% immature forms or bands. In clinical practice, SIRS criteria are used for the early detection of sepsis. In this study, SIRS was applied to assess participants' clinical status 24 hours after hospitalization.

The Thai version of the Confusion Assessment Method (CAM) algorithm was adapted from Inouye and colleagues (Inouye et al., 1990) and translated into Thai by Wongpakaran et al. (2011). This instrument is widely used and validated for assessing delirium as an acute confusional state. It consists of four key features: (1) acute onset and fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level of consciousness. Each feature was rated as "yes" or "no," and a diagnosis of delirium required the presence of Features 1 and 2 along with either Feature 3 or 4. The sensitivity and specificity of this instrument have been reported as 94–100% and 90–95%, respectively (Inouye et al., 1990). Before data collection, this study tested the CAM algorithm on 30 hospitalized older adult patients, yielding an inter-rater reliability score of 1.00.

### Data Collection

Data were collected between January 2022 and October 2022 by three researchers and two research assistants. Before the study began, they received training on the research instruments, specifically the CAM and TMSE tools. The data collection process involved reviewing medical records and assessing delirium using these instruments. Unfortunately, data collection occurred during the COVID-19 pandemic, which affected the sample size due to the limited number of available patients. However, researchers strictly adhered to social distancing, mask-wearing, and hand hygiene protocols.

Before data collection, all participants received an orientation about the study, including its objectives, potential risks and benefits, duration, and voluntary participation. They were informed that they could decline or withdraw from the study without affecting their relationship with the researchers, the institution, or healthcare providers. Researchers personally conducted orientation sessions in hospital wards for older adults who met the inclusion criteria. Participants were given a consent form to read and sign, and only after providing informed consent did the researchers proceed with collecting demographic and medical condition data. After obtaining consent, participants were assessed for the first time using the CAM algorithm, TMSE, and SIRS after 24 hours of hospitalization in stable condition. Researchers then conducted follow-up assessments on Day 3 and Day 7 or before discharge. In cases of early discharge, patients were assessed on Day 3, with subsequent follow-ups on Day 4, 5, or 6, depending on their condition. Each participant received a total of three follow-up visits to monitor delirium incidence.

### Data Analysis

Data were analyzed using SPSS (Version 28.0, IBM Corp, Armonk, New York). Descriptive statistics were used to summarize delirium status, exposure variables, and the overall cohort. Continuous variables were reported as means and standard deviations for normally distributed data or medians and interquartile ranges for non-normally distributed data. Categorical variables were presented as frequencies and percentages. Multiple logistic regression analysis was performed to examine factors associated with delirium. A two-sided p-value of <0.05 was considered statistically significant. The incidence rate of delirium was calculated as a percentage based on the number of patients who developed delirium during hospitalization on Day 3 and Day 7 or before discharge.

### Ethical Considerations

This study was approved by the Kuakarun Faculty of Nursing Ethics Committee for Research in Human, Institutional Review Board (Approval number KFN-IRB2020-10 in July 2020) and the Faculty of Medicine Vajira Hospital (Approval number COA 162/2563 in October 2020). The research was conducted in accordance with the 1964 Declaration of Helsinki, the Belmont Report, CIOMS Guidelines, and the International Conference on Harmonization in Good Clinical Practice. Participants signed informed consent prior to the study.

## Results

### Demographic and Clinical Characteristics

The participants had a mean age of 73.53 years (SD = 7.90), ranging from 60 to 89 years, with 50.60% being male. Approximately 47.60% were married, and 65.50% had completed primary education. More than 80% were unemployed, while 77.40% had sufficient monthly family income to cover their expenses. The majority (86.30%) lived with their spouses and children, and consequently, 62.50% had family caregivers. Regarding health conditions, nearly 92% of participants had chronic diseases, with hypertension (40.50%), diabetes mellitus (36.90%), and dyslipidemia (36.90%) being the most common. The primary reasons for admission included weakness and fatigue (28.60%), dyspnea (14.30%), fever (14.30%), abdominal pain, diarrhea, or melena (12.50%), and chest pain (6.50%). Most participants had comorbid conditions, with a median Charlson Comorbidity Index (CCI) score of 3 (interquartile range: IQR = 2–5).

The fluid imbalance was present in 67.30% of participants, with hyponatremia (47.60%) and hypokalemia (28.60%) being the most prevalent abnormalities. Additionally, 44.00% of participants were on 5–10 medications, and notably, 78.00% experienced polypharmacy, defined as taking more than five drugs. Cognitive impairment, as assessed by the TMSE instrument, was found in 40.50% of participants, while 71.00% showed signs of sepsis based on the SIRS criteria. Furthermore, the incidence rate of delirium among hospitalized older adults in internal medicine wards was 20.80%, with the majority (19.00%) developing delirium during the first assessment, which took place 24–48 hours after admission (**Table 1**).

**Table 1** Demographic and clinical characteristics of hospitalized older adults in medical wards (*N* = 168)

| Characteristics | *n* | % |
|---|---|---|
| **Age (years)** | | |
| Mean = 73.53, SD = 7.90, Min. = 60, Max. = 89 | | |
| **Gender** | | |
| Male | 85 | 50.60 |
| Female | 83 | 49.40 |
| **Marital status** | | |
| Single | 23 | 13.70 |
| Married/living together | 80 | 47.60 |
| Widow/divorced/separated | 65 | 38.70 |
| **Education** | | |
| None | 14 | 8.30 |
| Primary school | 110 | 65.50 |
| High school | 30 | 17.90 |
| High vocational certificate / bachelor's degree and higher | 14 | 8.30 |
| **Occupational status** | | |
| Unemployed | 140 | 83.33 |
| Employed | 28 | 16.67 |
| **Monthly income** | | |
| Sufficient for expenses | 130 | 77.40 |
| Sufficient; no savings | 7 | 4.20 |
| Insufficient for expenses | 19 | 11.30 |
| Not specified | 12 | 7.10 |
| **Living situation** | | |
| Alone | 9 | 5.40 |
| Spouse and children | 145 | 86.30 |
| Friends | 3 | 1.80 |
| Other | 11 | 6.50 |
| **Health conditions** | | |
| No chronic disease | 14 | 8.30 |
| Chronic disease | 154 | 91.66 |
| **Caregiver** | | |
| Spouse | 46 | 27.40 |
| Child/grandchild | 105 | 62.50 |
| Hired caregiver | 5 | 3.00 |
| Other | 12 | 22.60 |
| **Reason for admission** | | |
| Weakness/ fatigue | 48 | 28.60 |
| Dyspnea | 24 | 14.30 |
| Fever | 24 | 14.30 |
| Abdominal pain/diarrhea/melena | 21 | 12.50 |
| Chest pain | 11 | 6.50 |
| Other | 40 | 23.80 |
| **Medical history** | 160 | 95.20 |
| Hypertension | 68 | 40.50 |
| Diabetes mellitus | 62 | 36.90 |
| Dyslipidemia | 62 | 36.90 |
| Heart disease | 40 | 23.80 |
| Chronic kidney disease | 22 | 13.10 |
| Cancer | 14 | 8.30 |
| Chronic lung disease | 13 | 7.70 |
| Gastric ulcer | 2 | 1.20 |
| Other | 31 | 18.50 |
| **Comorbid conditions** | 147 | 87.50 |
| Charlson Comorbidity Index (CCI) score, Median (IQR) = 3 (2-5) | | |
| **Fluid intake and output** | | |
| Balance | 55 | 32.73 |
| Imbalance | 113 | 67.30 |
| **Electrolyte** | | |
| Balance | 29 | 17.26 |
| Imbalance | 139 | 82.74 |
| **Number of medications** | | |
| <5 | 37 | 22.00 |
| 5-10 | 74 | 44.00 |
| 11-15 | 45 | 26.80 |
| >15 | 12 | 7.10 |

Table 1 *(Cont.)*

| | | |
|---|---|---|
| **Polypharmacy** | 131 | 78.00 |
| **Cognitive impairment** | | |
| Yes | 68 | 40.48 |
| No | 100 | 59.52 |
| **Systemic inflammatory response syndrome (SIRS)** | | |
| Yes | 119 | 70.83 |
| No | 49 | 29.17 |
| **Delirium** | | |
| Yes | 35 | 20.83 |
| No | 133 | 79.17 |

### Correlations among Factors Related to Delirium

The factors associated with delirium among hospitalized older adults in internal medicine wards, as determined by univariable analysis, are presented in **Table 2**. The results indicated that gender, fluid and electrolyte imbalance, comorbidity, polypharmacy, and the absence of caregivers were not significantly associated with delirium ($p$ >0.05). However, age, employment status, dementia (TMSE ≤23), and infection (SIRS) were significantly associated with delirium ($p$ <0.05). Further analysis revealed that hospitalized older adults with dementia had a 9.30 times higher risk of developing delirium, while those with sepsis had a 2.97 times higher risk.

**Table 2** Univariate analysis of factors related to delirium among hospitalized older adults ($N$ = 168)

| Variables | Delirium | | β | OR | 95% CI | *p*-value |
|---|---|---|---|---|---|---|
| | Yes ($n$ = 35) | No ($n$ = 133) | | | | |
| **Age (years)** | 76.54 ± 7.42 | 72.74 ± 7.90 | 0.063 | 1.07 | (1.01-1.12) | 0.013* |
| **Occupational Status** | | | | | | |
| Unemployed | 34 (97.14%) | 106 (79.70%) | | 1.00 | Reference | - |
| Employed | 1 (2.86%) | 27 (20.30%) | -2.159 | 0.12 | | 0.037* |
| **Caregivers** | | | | | | |
| No | 5 (14.29%) | 7 (5.26%) | | 1.00 | Reference | - |
| Yes | 30 (85.71%) | 126 (94.74%) | -1.099 | 0.33 | (0.10-1.12) | 0.076 |
| **CCI Score, Median (IQR)** | 4 (3-5) | 3 (2-5) | 0.102 | 1.11 | (0.97-1.26) | 0.131 |
| **Fluid Imbalance** | 28 (80.00%) | 85 (63.91%) | 0.815 | 2.26 | (0.92-5.56) | 0.076 |
| **Hyponatremia** | 15 (42.86%) | 65 (48.88%) | -0.243 | 0.79 | (0.37-1.66) | 0.527 |
| **Hypernatremia** | 3 (8.58%) | 2 (1.50%) | 1.815 | 6.14 | (0.99-38.30) | 0.052 |
| **Hypokalemia** | 9 (25.71%) | 39 (29.32%) | -0.181 | 0.83 | (0.36-1.94) | 0.674 |
| **Hyperkalemia** | 1 (2.86%) | 5 (3.76%) | -0.284 | 0.75 | (0.09-6.66) | 0.799 |
| **Polypharmacy** | 28 (80.00%) | 103 (77.44%) | 0.153 | 1.17 | (0.46-2.93) | 0.746 |
| **Cognitive Impairment (TMSE ≤23)** | 28 (80.00%) | 40 (30.08%) | 2.230 | 9.30 | (3.75-23.04) | <0.001* |
| **SIRS** | 30 (85.71%) | 89 (66.92%) | 1.087 | 2.97 | (1.08-8.17) | 0.035* |

*Note:* Significant at $p$ <0.05

### Factors Predicting Delirium in Hospitalized Older Adults

In the multivariable analysis, age, presence of caregivers, dementia, and SIRS scores remained significant predictors of delirium after adjusting for other variables (**Table 3**). The strongest predictors included dementia (adjusted odds ratio: OR_adj = 7.81, 95% CI: 3.02–20.19, $p$ <0.001), SIRS (OR_adj = 3.80, 95% CI: 1.19–12.20, $p$ = 0.025), age (OR_adj = 1.09, 95% CI: 1.02–1.17, $p$ = 0.010), and having caregivers (OR_adj = 0.11, 95% CI: 0.02–0.56, $p$ = 0.008). Hospitalized older adults with dementia were 7.81 times more likely to develop delirium. Additionally, older age increased the risk of delirium by 1.09 times. Interestingly, having caregivers was associated with a lower risk of delirium, reducing the likelihood by 0.11 times. This model accounted for 35.30% of the total variance in delirium among hospitalized older adults in internal medicine wards.

**Table 3** Multivariable analysis of factors related to delirium among hospitalized older adults ($N$ = 168)

| Factors | β | OR_adj | 95% CI | *p*-value |
|---|---|---|---|---|
| **Age (years)** | 0.086 | 1.09 | (1.02 – 1.17) | 0.010* |
| **Caregivers** | | | | |
| - No | | 1.00 | Reference | - |
| - Yes | -2.174 | 0.11 | (0.02 – 0.56) | 0.008* |
| **Cognitive Impairment (TMSE ≤23)** | 2.055 | 7.81 | (3.02 – 20.19) | <0.001* |
| **SIRS** | 1.335 | 3.80 | (1.19 – 12.20) | 0.025* |

*Notes:*

Only *significant variables ($p$ <0.05) are shown in the table. Factors with $p$ <0.10 in univariable analysis were included in the multivariable model based on statistical and theoretical considerations. Adjusted Odds Ratios were estimated by multiple logistic regression with backward stepwise selection. The model explains 35.30% of the total variance in delirium among hospitalized older adults in internal medicine wards

Model Summary:

-2 Log likelihood = 128.890, Cox & Snell R-square = 0.226, Nagelkerke R-square = 0.353

Hosmer-Lemeshow test: Chi-square = 5.075, df = 8, $p$-value = 0.750

Constant = -8.036

# Discussion

This study aimed to identify the incidence rate and factors predicting delirium among older adults in internal medicine wards. The results revealed that the incidence rate of delirium among hospitalized older adults was 20.80%. During follow-up visits, 19.00% of participants developed delirium within the first 24–48 hours of admission. This rate is higher than in previous studies, which reported rates of 12.85% (Ngamkala et al., 2018), 10% (Arbabi et al., 2022), and 8% (Fortini et al., 2014). However, the findings align with a retrospective cohort study conducted in an emergency department in the United States, which reported an incidence of delirium in 24% of older adult patients (Elder et al., 2023). Similarly, a study conducted in Thailand by Chang et al. (2020) found that the incidence of delirium among hospitalized older adults ranged from 3.6% to 40.4%. One potential factor influencing the higher delirium rate in this study could be the COVID-19 pandemic. Restrictions on visitors and limited healthcare staffing during the pandemic may have contributed to the development of delirium in hospitalized older adults. Additionally, physical restraints were often used to prevent falls due to the limited number of staff, even though restraints have not been shown to reduce falls and may increase the risk of delirium (Inouye et al., 2014; Lach et al., 2016).

In this study, approximately 80% of hospitalized older adults who developed delirium were inadequately hydrated, and 26% experienced weakness or fatigue. Furthermore, 17.10% of older adults who developed delirium received sedatives in the emergency department or during hospitalization. These medical conditions, coupled with the use of sedatives, may have contributed to the onset of delirium (Elder et al., 2023; Nguyen et al., 2018).

The multivariable analysis identified several significant predictors of delirium. Age, caregivers, cognitive impairment (assessed by the TMSE), and infection (measured by SIRS) were significantly associated with delirium. Specifically, dementia, as determined by TMSE scores ≤ 23, was a strong predictor, with an adjusted odds ratio (OR_adj) of 7.81, indicating that older adults with dementia were 7.81 times more likely to develop delirium. This finding is consistent with previous studies that have identified cognitive impairment as a major risk factor for delirium (Arbabi et al., 2022; Fortini et al., 2014; Umurca et al., 2022). Chaiwat et al. (2019) further emphasized that the prevalence of dementia in delirious older adults was significantly higher when assessed using cognitive tools compared to history-based information. Delirium in older adults with dementia is often referred to as delirium superimposed on dementia (DSD), and this condition is associated with a higher risk of adverse outcomes (Inouye et al., 2014). Moreover, research suggests that shared biomarkers between delirium and dementia, such as plasma tau, may contribute to the development of delirium (Ballweg et al., 2021).

Infection, as detected by the SIRS criteria, was also associated with delirium. Nearly 71% of the older adults in this study were hospitalized due to infections, aligning with the findings of Arbabi et al. (2022), Fortini et al. (2014), and Nguyen et al. (2018), who reported that delirium is common in older adults but often underdiagnosed and poorly managed. Additionally, age was confirmed as an independent risk factor for delirium. Older adults were found to be at higher risk, with age over 70 years being strongly associated with delirium (Bo et al., 2019; ORegan et al., 2018; Umurca et al., 2022). Age-related microvascular changes in the brain may render older adults more susceptible to neurocognitive disorders, increasing the risk of delirium.

Another significant factor in the development of delirium was the presence of caregivers. Approximately 86% of older adults who developed delirium had caregivers prior to hospitalization. This finding is important, especially given the visiting restrictions during the COVID-19 pandemic. The absence of caregivers at the bedside could have contributed to the development of delirium in hospitalized older adults. This is supported by Sinaga et al. (2022), who found that older adults living with a spouse or family members experienced fewer mental health problems. In Thai culture, family support plays a crucial role in caregiving, and the lack of such support during hospitalization might have exacerbated the risk of delirium. Banerdt et al. (2021) also noted that being divorced or widowed increased the risk of delirium, possibly due to the lack of familial or social support.

The study's findings suggest that the presence of caregivers, along with appropriate family engagement and empowerment, can be an essential factor in preventing delirium among hospitalized older adults. Although caregiver involvement is typically associated with better overall outcomes and fewer hospital complications, the restrictions imposed during the pandemic likely played a role in increasing the risk of delirium. Thus, the study highlights the importance of family engagement and the need for strategies to support caregivers, especially during challenging times like the COVID-19 pandemic.

### Implications for Nursing Practice

The findings of this study provide empirical evidence that confirms the incidence and predictors of delirium among hospitalized older adults in internal medicine wards in Bangkok, Thailand. The study emphasizes the need for healthcare providers to implement comprehensive intervention programs to prevent, detect, and manage delirium, as well as address the precipitating and predisposing factors that contribute to delirium risk. For example, cognitive impairment, as assessed by the TMSE, was found to be strongly associated with delirium, underlining the necessity for routine cognitive screenings upon admission. Nurses should be trained to recognize early signs of cognitive decline and delirium, collaborating with interdisciplinary teams to ensure timely diagnosis and management. Early identification of patients at risk for delirium will allow for proactive interventions, such as cognitive stimulation and environmental modifications, to reduce delirium risk.

Additionally, this study identified infection (evidenced by SIRS scores) as a significant predictor of delirium. Given that infections are a common reason for hospitalization in older adults, nurses must monitor for signs of infection, paying close attention to vital signs, laboratory results, and clinical symptoms. The prompt detection and treatment of infections can significantly decrease the likelihood of delirium. Furthermore, nurses should advocate for preventive measures

such as proper hydration and nutrition, particularly in older adults at risk for dehydration and malnutrition.

The study's findings also highlight that older age is a significant factor in delirium, with older adults being more vulnerable due to age-related microvascular changes in the brain. Nurses should tailor interventions to meet their unique needs by focusing on fall prevention strategies, improving environmental safety, and reducing the use of sedatives, which have been associated with an increased risk of delirium. Educating patients and their families about the signs and symptoms of delirium can help empower them to actively participate in care, further improving outcomes.

Another key finding of this study was the role of caregivers. The presence of caregivers before hospitalization was linked to a lower risk of delirium. During the COVID-19 pandemic, however, restrictions on visitation may have contributed to an increased risk of delirium due to the absence of family support. Nurses should advocate for policies that allow caregivers to be more actively involved in the care of hospitalized older adults, especially those at risk for delirium. Encouraging family participation, even if virtual, can have a protective effect on mental health and help older adults remain oriented during their hospitalization.

By integrating these findings, nurses and healthcare providers can develop evidence-based nursing guidelines that target delirium prevention and improve care for older adults. This includes promoting a multidisciplinary approach where nurses collaborate with physicians, occupational therapists, and social workers to ensure comprehensive care. The development of protocols such as regular cognitive assessments, hydration strategies, and infection control measures should become routine practices in hospitals to reduce the risk of delirium in older adults.

Lastly, in the context of the Roy Adaptation Model (RAM), this study's findings suggest that delirium in hospitalized older adults can be understood through the lens of focal, contextual, and residual stimuli. Focal stimuli like cognitive impairment, infection, and age directly contribute to maladaptive responses, while contextual stimuli, such as limited caregiver presence due to COVID-19 restrictions, exacerbate these effects. Residual stimuli, such as pre-existing dementia, also play a role. Nurses, guided by RAM, can address these factors to promote adaptation and minimize delirium, ensuring better patient outcomes through tailored interventions.

### Limitations

This study has several limitations. First, the data were collected from a single urban academic hospital with four internal medicine wards in Bangkok, which may limit the generalizability of the findings to other hospitals or settings. Therefore, the results may not fully represent hospitalized older adults in internal medicine wards across different institutions. Second, the study was conducted during the COVID-19 pandemic, which presented challenges in contacting participants for data collection. Despite these challenges, the researchers adhered to hospital health protocols to minimize the risk of COVID-19 transmission. Last, the model accounted for only 35.30% of the variance in delirium (including factors such as dementia, SIRS scores, older age, and the presence of caregivers). This indicates that other influential factors not included in this study may contribute to delirium. Future research should aim to identify additional predictors to provide a more comprehensive understanding of delirium in hospitalized older adults.

## Conclusion

This study found that the incidence rate of delirium among hospitalized older adults in internal medicine wards was 20.80%, with 19.00% of participants developing delirium within the first 24 to 48 hours of admission. Multivariate analysis revealed that cognitive impairment, infection, age, and the presence of caregivers before admission were significantly associated with the development of delirium in the internal medicine wards of the studied urban hospital in Bangkok, Thailand. These findings highlight the need for early delirium detection upon admission, particularly through cognitive assessments. Tools such as the CAM algorithm and TMSE should be incorporated into nursing practice for delirium prevention. Furthermore, infection prevention and management are critical to reducing the delirium risk among hospitalized older adults. Future research is necessary to expand on these findings and develop evidence-based guidelines or programs for delirium prevention in internal medicine wards.

## Declaration of Conflicting Interest

There is no conflict of interest to declare.

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## Authors' Contributions

All authors contributed substantially to the conception and design, data acquisition, or data analysis and interpretation. In addition, all drafted the manuscripts or revised them critically for important intellectual content and approved the final version.

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## Data Availability

The dataset generated during and analyzed during the current study is available from the corresponding author upon reasonable request.

## Declaration of Use of AI in Scientific Writing

There is nothing to declare.

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