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Change is in the air!

Dear CJCN readership,

The Fall equinox is upon us, and with it, a transition to fewer hours of sunlight, colder weather, and changing leaves. This Fall issue also heralds change, as it marks Dr. Sawatzky's final work as editor of the *Canadian Journal of Cardiovascular Nursing* (CJCN) – she is officially retiring after five arduous and dynamic years in the role. Dr. Sawatzky has been a steadfast champion of the Canadian Council of Cardiovascular Nurses for many years, and a vital part of the CJCN for over a decade. She stepped into the role of CJCN editor in 2019 after serving as Associate Editor from 2012–2019. During her 5-year tenure as Editor-in-Chief, she tirelessly supported the journal, being particularly passionate about supporting the scholarly writing of novice researchers finding their path in the world of peer-reviewed, academic publishing.

Dr. Sawatzky retires with an impressive legacy of national cardiovascular nursing leadership in education, research, and clinical practice. In recent years, Dr. Sawatzky was the Associate Dean of Graduate Programs in the College of Nursing at the University of Manitoba, providing leadership in the development of the PhD program and the expansion of the Nurse Practitioner program. She served as a key mentor for cardiovascular nurses across Canada, including the Canadian Institutes of Health Research-funded FUTURE program for cardiovascular nurse scientists. Dr. Sawatzky's program of research was focused on cardiac nursing and women's health, advocating for the clinical nursing research associate roles embedded in clinical areas across Manitoba. On behalf of the readership and cardiovascular nurses across Canada, we thank Dr. Sawatzky for her contributions and wish her a blissful retirement.

We forge ahead into this new chapter with a novel co-leadership model for the CJCN. We, Davina Banner RN, PhD, Professor in the School of Nursing at the University of Northern British Columbia, and Krystina Lewis, RN, PhD, Assistant Professor in the School of Nursing University of Ottawa, both of whom have been CJCN Associate Editors for over 5 years and committed CCCN members for over a decade, are committed to working together – and with you – to further build and revitalize this venue for scholarly works and conversations. Krystina will take on the role of *Editor-in-Chief*, responsible for 1) the development and implementation of strategies to increase scholarly submissions, 2) build the CJCN Editorial Board through the recruitment and mentorship of new Associate Editors and peer reviewers, and 3) sit on the CCCN Board as the Director of Publications. Davina will take on the role of *Managing Editor*, responsible for 1) overseeing and managing submissions, 2) facilitating the peer review process, and 3) communicating with corresponding authors.

Our debut as *Editor-in-Chief* and *Managing Editor* comes at a time of increasing uncertainty for the journal, as declining submissions have led to a decrease in the number of journal issues. Here, we highlight our desire to revitalize and rebuild, including the need to increase the number of submissions and opportunity to expand our readership. We know that the amount of high-quality, rigorous research led by cardiovascular nurses and allied health professionals is increasing nationally, and even more so globally. Our journal serves a diverse and vast community of practice, spanning cardiovascular settings and care across Canada. From essential community-based primary care initiatives to new and bold critical care enterprises, to rehabilitation programs improving people's outcomes after a life-changing event, cardiovascular nurses are instrumental. The CJCN is a place to share these initiatives and mobilize knowledge for the advancement of healthcare and improvement of health outcomes for people and communities of Canada.

A journal's success depends on a team effort. It relies on contributions from authors, editors, and peer-reviewers, which collectively allow the journal to publish articles of the highest quality. This can only be achieved as a community. We are reaching out to you, the cardiovascular nursing and allied health communities, all of which have their own networks to leverage, and extend a heartfelt invitation to join in our efforts. We encourage you to consider ways to contribute to the growth of the CJCN. The journal is a home for our collective voice and experiences, and, as such, can demonstrate the relevance and importance of cardiovascular nursing across other conditions, disciplines, and sectors.

Together, we must work to ensure that the CJCN continues to grow as a respected venue to showcase high-quality cardiovascular nursing research, clinical and educational quality improvement initiatives, and novel, interesting clinical cases that we know are underway from coast-to-coast. Further, we want to hear from you. What would you like to see published in the journal?

As we bid farewell to Dr. Sawatzky and start this journey together with you, we hope you will reach out to us (Krystina.Lewis@uottawa.ca and Davina.Banner-Lukaris@unbc.ca), share your thoughts and ideas for the journal, and be an active member of this Canadian community of cardiovascular nursing.

We look forward to working with you,
Krystina Lewis and Davina Banner

Canadian Council of Cardiovascular Nurses

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CANADIAN ASSOCIATION OF CRITICAL CARE NURSES

Canadian Journal of Cardiovascular Nursing (CJCN)
&
Canadian Journal of Critical Care Nursing (CJCCN)

invite submissions for a Special Collaborative Theme Issue:

Cardiovascular & Critical Care Nursing: Connections to Care

The CJCN & CJCCN are pleased to announce the extension of the deadline for the call for papers for a special collaborative theme issue on cardiovascular and critical care nursing has been extended.

We invite researchers, clinicians, educators, and administrators to consider submitting short reports on novel research projects, clinical/practice, education, or administrative-related topics related to cardiovascular and critical care.

Deadline for submissions: January 31, 2025.

Criteria for all submissions:
1. Page limit: max 15 double-spaced pages [including title page].
2. Abstract: max 200 words; APA 7th ed

For all other submission criteria, follow the Author Guidelines for the CJCN (https://cccn.ca/journal/author-guidelines) or CJCCN (https://cjccn.ca/aim-scope-guidelines-for-authors/) for research/non-research papers (note: specify which guidelines were followed in the cover letter).

Potential topic areas common to cardiovascular and critical care nurses include:
- Case reports
- QA projects
- Advanced cardiac assessment
- Advanced/novel arrythmias?
- Advanced organ support
- Support/initiatives for inclusion of family
- Specific initiatives or research directed toward care of diverse populations
- Novel models of care across the continuum

*Please direct queries/submissions to Krystina Lewis & Davina Banner-Lukaris, CJCN Co-Editors-in-Chief at Krystina.Lewis@uottawa.ca or Davina.Banner-Lukaris@unbc.ca

Cardiac Arrhythmias in Healthy Women During or Post-Pregnancy: A Scoping Review

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Abstract

Pregnant and postpartum women are at risk of developing cardiac arrhythmias. There is negligible published research on the development of peripartum and postpartum electrophysiological complications in previously healthy women. The purpose of this scoping review was to map existing evidence about cardiac arrhythmia development in previously healthy pregnant or postpartum women and provide an overview of prevalence and underlying mechanisms on this topic. Using JBI methodology, we completed systematic searches in CINAHL, Medline, and Healthstar databases, and a multi-step screening process; thirteen articles were included. Thematic analysis revealed three themes: 1) Electrocardiography and cardiac findings; 2) Hemodynamic, autonomic, and hormonal changes in pregnancy; and 3) Conflicting information on the effect of maternal age on cardiac arrhythmias. Nursing awareness of the risk for cardiac arrhythmias during pregnancy is imperative to ensure timely intervention. As well, qualitative exploration of previously healthy women's lived experiences with cardiac arrhythmias is warranted.

Keywords: electrophysiology, pregnancy, arrhythmia, women

Metersky, K., Kwek, O. L., Chandrasekaran, K., Kaur, P., & Fredericks, S. (2024). Cardiac arrhythmias in healthy women during or post-pregnancy: A scoping review. *Canadian Journal of Cardiovascular Nursing*, *34*(2), 5–13. https://doi.org/10.5737/cjcn-34-2-5

Key Highlights

- This scoping review revealed various arrhythmias reported in previously healthy pregnant or postpartum women.
- Development of cardiac arrhythmias may be attributed to age, as well as the hemodynamic, autonomic, and hormonal changes that occur during pregnancy.
- Nurses must be aware of previously healthy women's risk for, and identify and monitor, cardiac arrhythmias to ensure timely and optimal interventions.
- Further research, especially qualitative studies, are needed to explore lived experiences of healthy pregnant women with cardiac arrythmias.

Introduction

Pregnancy induces a time of various anatomical and physiological changes in a woman's body, which can have significant implications on the cardiac system (e.g., increased blood volume and cardiac output; Soma-Pillay et al., 2016). These unique hormonal and physiological changes are associated with a greater risk of cardiac arrhythmias, despite the absence of cardiovascular pathology prior to the pregnancy (Sanghavi & Rutherford, 2014).

The literature reports the incidence of cardiac arrhythmias to be a common symptom in pregnancy. During pregnancy, the heart rate progressively increases by 10% to 25% from pre-pregnancy values (Davis, 2022). Therefore, sinus tachycardia, especially in the third trimester, is not uncommon (Adamson & Nelson-Piercy, 2007; Safavi-Naeini et al., 2021). Li et al. (2008) found that maternal arrhythmias have an event rate of approximately 166/100,000. However, this statistic may underestimate the total prevalence, as it does not factor in the additional cases of arrhythmias that occur in the community that are under-reported. According to Gałczyński et al. (2013), the incidence of arrhythmias during pregnancy is estimated to be 1.2 per 1,000 pregnancies, with about half of these arrhythmic episodes being asymptomatic. Although more recent statistics have not been published, the incidence of arrhythmias during pregnancy has been increasing and becoming a growing concern in healthcare (Tamirisa et al., 2022).

While palpitations and arrhythmias during pregnancy are common, they are typically benign and subside within a brief period of time without treatment (Cleveland Clinic, 2024; Senarath et al., 2021). However, some arrhythmias during pregnancy can be concerning. For example, Coad and Frise (2021) reported that tachyarrhythmias during pregnancy are an urgent health issue that must be addressed with appropriate follow-up, as it may cause hemodynamic instability and consequent placental hypoperfusion, requiring immediate cardioversion. Moreover, sustained palpitations can occur secondary to ventricular arrhythmias, such

as idiopathic ventricular tachycardia (VT) or pathway-related supraventricular tachycardia (SVT; Senarath et al., 2021), which require immediate medical treatment. While SVT has been identified as the most prevalent form of arrhythmias in healthy women during pregnancy (Ramlakhan et al., 2022; Senarath et al., 2021; Uzakova et al., 2023), other types of arrhythmias, such as catecholaminergic polymorphic VT, Brugada syndrome, and arrhythmogenic right ventricular cardiomyopathy are less prevalent (Tamirisa et al., 2022).

Finally, cardiac arrhythmias during and/or post-pregnancy can increase the potential for sudden cardiac death (Conti et al., 2024).

Therefore, it is imperative for cardiovascular nurses to be aware of the risk of arrhythmias during pregnancy and the postpartum period. By being knowledgeable about the specific risks and presentations of cardiac arrhythmias in pregnancy, cardiovascular nurses can provide comprehensive care and collaborate with other healthcare providers to develop and implement appropriate treatment plans with patients and their families (Conti et al., 2024). This proactive approach not only safeguards maternal and fetal health, but also contributes to overall positive pregnancy experiences and outcomes (Conti et al., 2024).

There has been negligible research on the prevalence and development of peripartum and postpartum cardiomyopathy (Ramlakhan et al., 2022; Senarath et al., 2021). Moreover, research has seldomly focused on women who develop arrhythmias for the first time in their second or subsequent pregnancy or postpartum period (Hutchens et al., 2022). As no previous literature review could be located, a comprehensive review is essential to identify gaps in existing knowledge and establish the foundation for future studies in this area.

Aim

The aim of this scoping review was to identify the nature and extent of existing evidence on cardiac arrhythmias in women without any related significant medical history, who received a diagnosis of cardiac arrhythmia during pregnancy or in the immediate postpartum period. The following research questions were developed using the population, concepts, and context (PCC) framework (Pollock et al., 2021; Tricco et al., 2018). The population included women who developed cardiac arrhythmia during pregnancy or the postpartum period, with core concepts focusing on cardiac arrhythmia, pregnancy, postpartum, and multiple pregnancy, applicable in any geographical setting.

1. What is reported in the current literature on the development of cardiac arrhythmias among women during pregnancy or in the immediate postpartum period who did not have any prior related significant medical history?
2. What is reported in the current literature on the development of cardiac arrhythmias among women who are pregnant with their second or subsequent pregnancy or postpartum period?

Methods

The Joanna Briggs Institute (JBI) scoping review method (Aromataris & Munn, 2020) and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis extension for Scoping Reviews (PRISMA-ScR) checklist (Tricco et al., 2018) guided this review. Although there are other frameworks that can be used to report scoping review findings, the JBI method is recommended as it was developed to improve quality and conduct of reporting such reviews (McGowan et al., 2020). The protocol for this scoping review has not been published.

Eligibility Criteria

Sources were considered for inclusion if they met the following criteria: 1) published in a peer-reviewed journal; 2) were full-text accessible; 3) included the population of pregnant or postpartum women; and 4) discussed the diagnosis of cardiac arrhythmias during pregnancy or in the postpartum period. This review was open to all sources. However, it was limited to studies published in English due to the time and financial constraints of translation. No time limitations were applied to thoroughly map the literature available on this topic.

Information Sources and Search

Systematic searches in CINAHL, Medline, and Healthstar databases were performed in May 2023 and repeated in September 2023. To ensure the search strategy yielded relevant results, the team consulted with a subject librarian. Medical subject headings (MeSH) 'Arrhythmia' OR 'Ventricular Arrhythmia' OR 'Sinus Arrhythmia' or 'Atrial arrhythmia' or 'Extrasystole' AND 'Pregnancy' OR 'Multiple Pregnancy' or 'Prolonged Pregnancy' or 'High-Risk Pregnancy' were used in the CINAHL database with Boolean operators OR/AND. Reference lists of included studies were also explored.

The search generated a total of 1,870 records. After removing 861 duplicates, 1,009 were screened by title and abstract, resulting in the exclusion of 955 articles at stage one. This resulted in 54 articles that proceeded to independent full-text review equating to 13 articles that met the inclusion criteria (see Figure 1: PRISMA flow chart).

Selection of Sources of Evidence

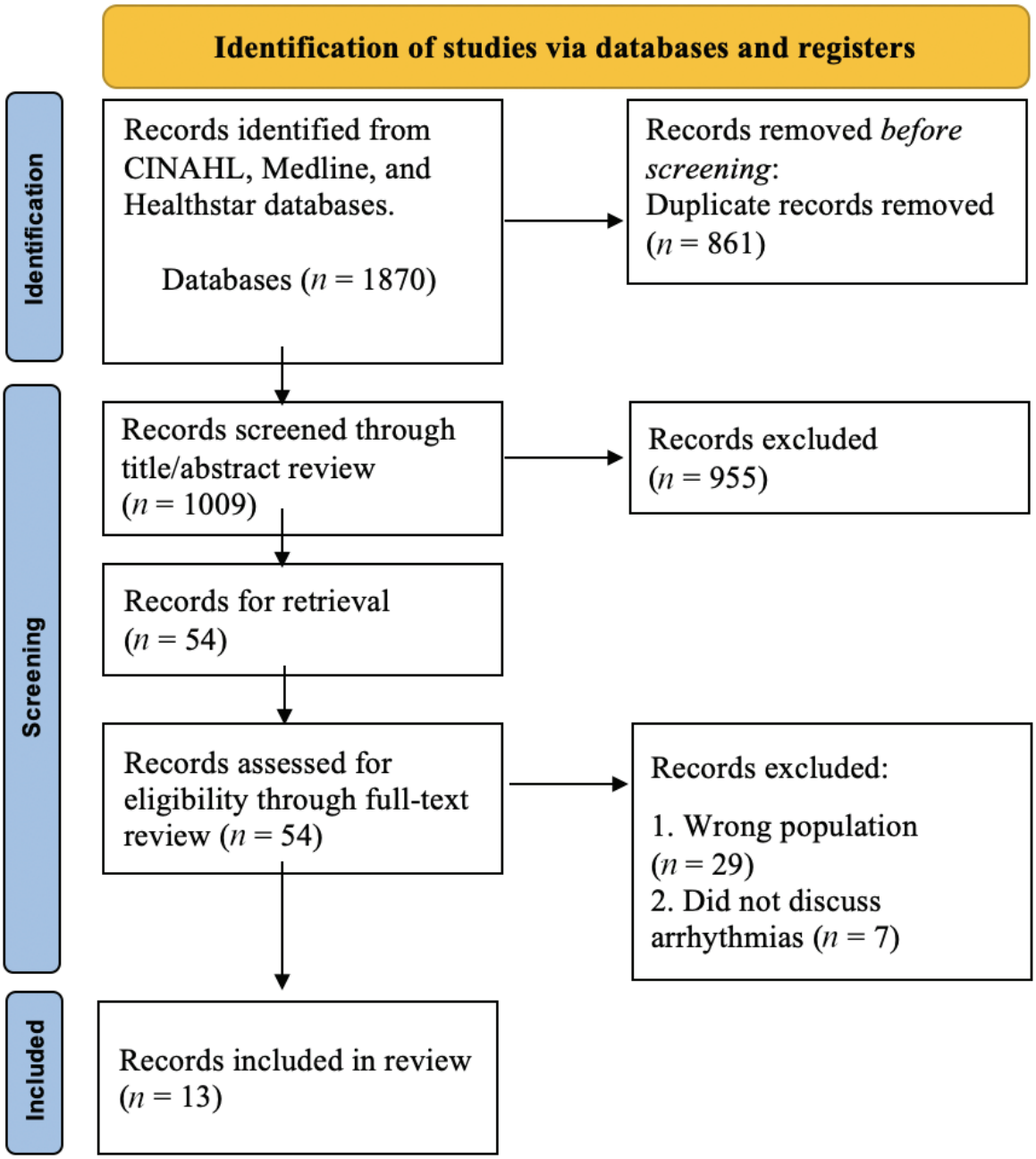
All articles retrieved from the search were reviewed by the first two authors (KM & SF) and two trained research assistants (KC & PK). A two-stage screening process was used. In the first stage, titles and abstracts were reviewed. If the article met the eligibility criteria or if it was not clear, the article was moved to stage two to undergo a full text review. Any disagreements were resolved with consultation with an additional reviewer (KC).

Data Charting Process and Data Items

Microsoft's Excel program was utilized to create data extraction tables where key data was organized. In the data charting process, the variables collected included author(s),

Figure 1

PRISMA-ScR Flow Chart



title, year, journal, study type, study purpose, setting, population of interest, sample size, procedures/ measures, findings, gaps, and conclusions (see Table 1).

Synthesis of Results

The narrative synthesis approach outlined by Popay et al. (2006) was an appropriate method to summarize findings from different studies of varying research designs and methodologies. This approach includes four elements and provided guidance on different tools that can be implemented to improve the rigour and trustworthiness of the synthesis (Popay et al., 2006).

Element 1: Selecting a Theoretical Framework

As this topic has not been extensively studied, the team did not select a specific theory to guide this review. As opposed to relying on a pre-existing theory, this review sought to identify concepts, themes, and factors that emerged from across the included literature.

Table 1

Extraction Table of Included Studies

Authors (Year)/ Setting	Study Design	Purpose	Main Findings
Altun et al. (2014) Türkiye	Quantitative/Cross-sectional Study (N = 30)	To evaluate atrial conduction abnormalities obtained by tissue Doppler imaging (TDI) and electrocardiogram analysis in pregnant subjects	Inter-atrial, intra-atrial, and intra-left atrial electromechanical coupling intervals were prolonged in the pregnant subjects compared to the age-matched controls. No relationship was detected between the atrial electromechanical coupling parameters and maternal age.
Choi et al. (2001) Seoul, Korea	Quantitative/Case series study/Cross-sectional (N = 261)	To investigate the incidence, severity/ time-course of dyspnea and palpitation among normal pregnant women	Arrhythmias documented in only 22% of patients having 24-hour Holter monitoring. A high incidence (11.5%) of gestational palpitation and increased while pregnancy approached to term.
Coad & Frise (2021) Various cities, UK	Discussion paper	To provide a robust approach to the investigation and management of a persistent tachycardia in pregnancy	Tachyarrhythmia in the presence of structural heart disease could rapidly result in haemodynamic instability and subsequent placental hypoperfusion.
Gonçalves et al. (2022) Angola	Quantitative/Cross-sectional community-based case study (N = 234)	To describe electrocardiographic findings in women with normal pregnancies, compared with a paired control group of non-pregnant women	Electrocardiographic changes found: Sinus tachycardia (4.4% vs. 2.5%), T-wave inversion (14.9% vs. 1.7%), minor ST segment depression (4.5% vs. 0%) and left ventricular hypertrophy (11.4% vs. 11.7%, $p = .726$).
Kandzia et al. (2022) Poland	Quantitative/ Prospective cohort/ Longitudinal (N = 160)	To determine the TpTe (Tpeak-Tend) interval in women in the first, second and third trimester of pregnancy and the post-partum period	Mean duration of TpTe interval during pregnancy (81.59 ± 5.92 ms) and in the whole study group (pregnancy + postpartum; 85.46 ± 6.45 ms) was significantly longer ($p < 0.001$) compared to the TpTe interval in the control group (74.06 ± 6.14 ms). During pregnancy and postpartum, the increase in the TpTe interval compared to the increase in the corrected QT interval (QTc) parameter (31.10% vs. 4.18%) was significantly higher ($p < 0.001$).
Köşüş et al. (2011) Türkiye	Quantitative/ Retrospective cohort study/Longitudinal (N = 34)	To examine the maternal and fetal effects of arrhythmias detected by ECG monitoring during labour in patients at term, without any known cardiovascular pathology	Sinus tachycardia was the most observed, with a frequency of 70.6%. The highest rate of arrhythmias was recorded for the active phase group (29 of 47 had arrhythmias), with sinus tachycardia being the most common type ($n = 10$). This group also had three patients with supraventricular tachycardia (8.8%) and two patients with T-negativity (5.8%). Sinus tachycardia was the most frequently observed arrhythmia in the latent phase group ($n = 5$).
Kugamoorthy & Spears (2020) Toronto, Canada	Discussion paper	To discuss the topic of management in tachyarrhythmia in pregnancy	Idiopathic ventricular arrhythmias occur in the absence of structural heart diseases.
Li et al. (2008) Washington, USA	Quantitative/ Retrospective study/ Longitudinal (N = 226)	To examine the occurrence and outcome of cardiac arrhythmias during pregnancy in one of the busiest obstetric services in the USA	Most common rhythm disturbances during pregnancy were sinus tachycardia (ST), sinus bradycardia (SB), or sinus arrhythmia (SA; 104 episodes/100,000 pregnancies). Paroxysmal supraventricular tachycardia (PSVT) and premature beats, with a frequency of 24/100,000 and 33/100,000, respectively.

continued…

Li et al. (2019) Beijing, China	Quantitative/ Retrospective study/ Longitudinal (N = 28)	To investigate the incidence of idiopathic sustained maternal arrhythmia	Among patients without history of tachyarrhythmia, 38.6% developed tachyarrhythmia in first trimester, 31.8% in second trimester, and 29.6% in third trimester.
Manolis et al. (2020) Canterbury, UK	Discussion paper	To discuss the management of cardiac arrhythmias in pregnancy for mother and fetus protection	While older studies had indicated supraventricular tachycardia as the most common tachyarrhythmia in pregnancy, more recent data indicate an increase in the frequency of arrhythmias, with atrial fibrillation (AF) emerging as the most frequent arrhythmia in pregnancy, attributed to an increase in maternal age, cardiovascular risk factors, and congenital heart defects (CHD) in pregnancy.
Nikoo et al. (2014) Shiraz, Iran	Quantitative/Cross-sectional study (N = 234)	To find any relationship between maternal age and ventricular arrhythmia risk with the use of QT dispersion (QTd) as an index	Although QTd was prolonged in all three age groups, no significant difference was observed among the three groups regarding QTd.
Shotan et al. (1997) Los Angeles, USA	Quantitative/Cross-sectional study (N = 110)	To assess prevalence of cardiac arrhythmias during gestation and their relation to subjective complaints of palpitations, dizziness, and syncope in healthy women, comparing two groups	Both groups had a high incidence of arrhythmias on Holter monitoring with atrial premature complexes (APCs) of 56% in the study group and 58% in the control group, >100 APCs in 7% and 4% of the patients, respectively, and isolated ventricular premature complexes (VPCs) in 59% and 50%, respectively. The number of isolated VPCs was higher and >50 VPCs/hour were seen in significantly more patients in the study group.
Romem et al. (2004) Tel-Aviv, Israel	Quantitative/ Retrospective/ Longitudinal (N = 30)	To assess the incidence and characteristics of maternal cardiac arrhythmias during labour	Tachycardia was recorded in all these women and bradycardia in 50%.

Element 2: Developing a Preliminary Synthesis

The preliminary synthesis involved extracting key information from all included studies. The tabulation technique was utilized to create extraction tables using Microsoft Excel.

Element 3: Exploring Relationships Within and Between All Included Studies

The research team used thematic analysis to identify recurring themes, patterns, or concepts across included studies. Braun and Clarke's (2006) six-phase framework was used to conduct thematic analysis, which was confirmed with all team members, to enhance the credibility and reliability of the findings.

Element 4: Assessing the Robustness of the Synthesis

To ensure robustness of this narrative synthesis, the team clearly defined the review questions and eligibility criteria that were developed using the PCC framework (Peters et al., 2015; Pollock et al., 2021). The team adhered to the PRISMA-ScR checklist and a clear audit trail was provided as articles excluded at each level of screening were numerically recorded in the PRISMA-ScR flowchart (see Figure 1).

Results

Thirteen articles met the eligibility criteria. No additional articles were located through reference list reviews of included articles (see Figure 1). All articles included in this review addressed the diagnosis of cardiac arrhythmias in previously healthy pregnant or postpartum women. Of the 13 studies included in the review, five were cross-sectional, quantitative in design (Altun et al., 2014; Choi et al., 2001; Gonçalves et al., 2022; Nikoo et al., 2014; Shotan et al., 1997). One was a case study (Choi et al., 2001). Five studies were longitudinal, quantitative in design (Kandzia et al., 2022; Köşüş et al., 2011; Li et al., 2008; Li et al., 2019; Romem et al., 2004). Among these, four were retrospective (Köşüş et al., 2011; Li et al., 2008; Li et al., 2019; Romem et al., 2004) and one was a prospective cohort study (Kandzia et al., 2022). The three other included articles were discussion papers (Coad & Frise, 2021; Kugamoorthy & Spears, 2020; Manolis et al., 2020).

The articles provided a global perspective, as they originated from United Kingdom ($n = 2$; Coad & Frise, 2021; Manolis et al., 2020), Türkiye ($n = 2$; Altun et al., 2014; Köşüş et al., 2011), the United States of America ($n = 2$; Li et al., 2008; Shotan et al., 1997), China ($n = 1$; Li et al., 2019), Iran ($n = 1$; Nikoo et al., 2014), Poland ($n = 1$; Kandzia et al., 2022), Angola ($n = 1$; Gonçalves et al., 2022), Korea ($n = 1$; Choi et al., 2001), Israel ($n = 1$; Romem et al., 2004), and Canada (n=1; Kugamoorthy & Spears, 2020; see Table 1). Eight articles reported specifically where the previously healthy

pregnant or postpartum women were receiving care. Four articles reported the pregnant women to be receiving care at a hospital (Choi et al., 2001; Li et al., 2008; Li et al., 2019; Romem et al., 2004), whereas four other articles reported they were receiving care at a clinic (Kandzia et al., 2022; Köşüş et al., 2011; Nikoo et al., 2014; Shotan et al., 1997).

Critical Appraisal of Evidence: Themes

Following the process of data analysis, three themes associated with the diagnosis of cardiac arrhythmias in previously healthy women who were pregnant or in the postpartum period were extracted from the data: 1) electrocardiography and cardiac findings; 2) hemodynamic, autonomic, and hormonal changes that occur in pregnancy; and 3) conflicting information available regarding the effect of maternal age on cardiac arrhythmia.

Theme One: Electrocardiography and Cardiac Findings

All included studies reported the onset of cardiac arrhythmias in some pregnant and/or postpartum women participants, despite having no explicit history of cardiac illness and who were previously healthy. Six articles reported on development of various tachyarrhythmias (Coad & Frise, 2021; Kandzia et al., 2022; Kugamoorthy & Spears, 2020; Li et al., 2019; Manolis et al., 2020; Romem et al., 2004). In a quantitative, cross-sectional study (N = 28 pregnant women; aged 21–37), Li et al. (2019) identified that 38.6% of women developed tachyarrhythmia in the first trimester, 31.8% in the second trimester, and 29.6% in the third trimester. In another quantitative cross-sectional study (N = 36 healthy pregnant women aged 18–36, in active labour), Romem et al. (2004) reported tachycardia in all participants. According to a discussion paper by Coad and Frise (2021), any tachyarrhythmia during pregnancy is an urgent health issue that requires appropriate follow-up, as it can cause hemodynamic instability and subsequent placental hypoperfusion.

Four articles reported specifically on the onset of SVT (Kugamoorthy & Spears, 2020; Lee et al., 1995; Li et al., 2008; Manolis et al., 2020). Li et al. (2008) conducted a quantitative, retrospective study that analyzed pregnancy related admissions to the obstetric unit between 1992 and 2000 (N = 136,422), 226 of which were related to cardiac arrhythmias (Li et al., 2008). The mean age of women with a cardiac arrhythmia was 24 years old; most (84%) were Hispanic/African American. The study found a high frequency of SVT occurrence (24/100,000; Li et al., 2008). In a quantitative, cross-sectional study Lee et al. (1995) analyzed 207 women with a mean age of 43 hospitalized for symptomatic SVT, most of whom (83.57%; $n = 173$) had been previously pregnant. Participants completed questionnaires with questions about onset and severity of symptoms, number of pregnancies and their age for each of these items. Episodes of SVT during pregnancy were significantly more symptomatic compared to episodes during the non-pregnant periods. Fourteen women with attacks of paroxysmal SVT had exacerbation of this condition during pregnancy and self-reported higher symptom scores of palpitations, fatigue, dyspnea, dizziness, blurred vision, and syncope (Lee et al., 1995). Both of these studies reported an SVT occurrence in 0.02%–0.5% of pregnancies (Lee et al., 1995; Li et al., 2008). Based on relatively recent reviews of the literature, Kugamoorthy and Spears (2020) and Manolis et al. (2020) also concluded SVT to be the most frequent sustained arrhythmia in this population.

Theme Two: Hemodynamic, Autonomic, and Hormonal Changes in Pregnancy

Three studies reported on the hemodynamic, autonomic, and hormonal changes that occur during pregnancy (Altun et al., 2014; Köşüş et al., 2011; Nikoo et al., 2014). Nikoo and colleagues (2014) conducted a cross-sectional study of women (N = 234) between 36–40 weeks pregnant, who were referred to two private obstetric clinics with reported QT prolongation in preg-nancy. Participants were divided into three groups based on age (Group 1: < 20 years; Group 2: 20–35 years; Group 3 >35 years). Although prolonged QT dispersion (QTd) in all groups was observed, there was no significant difference in QT prolongation based on age; this finding was attributed to the hemodynamic, autonomic, and hormonal changes that occur during pregnancy (Nikoo et al., 2014).

In a quantitative cross-sectional study Altun et al. (2014) analyzed atrial conduction abnormalities among 30 pregnant women with a mean age of 28 in the second trimester, between 18 and 23 weeks and 30 age-matched controls. Altun et al. found that atrial electromechanical coupling intervals and P-wave dispersion, which are predictors of atrial fibrillation, were significantly longer in pregnant patients. In particular, inter-atrial, intra-atrial, and intra-left atrial electromechanical coupling intervals were prolonged in the pregnant subjects compared to the age-matched controls (26.4 ± 4.0 versus 20.2 ± 3.6 ms, $p < 0.001$; 10.0 ± 2.0 versus 8.0 ± 2.6 ms, $p = 0.002$; 16.4 ± 3.3 versus 12.2 ± 3.0 ms, $p < 0.001$, respectively). This finding was attributed to the increases in blood volume, cardiac output, elevated levels of estrogen and β-human chorionic gonadotropin that occur during pregnancy (Altun et al., 2014).

Among a sample of 38 pregnant women with a mean age of 29 that were referred to an obstetric clinic in Ankara, Türkiye, Köşüş et al. (2011) reported the diagnosis of cardiac arrhythmia in 82.3 percent of patients in all stages of labour. Sinus tachycardia was found to be the most common arrhythmia (24 cases). However, other forms of cardiac arrhythmias were also observed that included: supraventricular tachycardia (three cases), T-wave inversion (two cases) and ventricular extrasystole (one case; Köşüş et al., 2011). These arrhythmias were attributed to the increase in adrenergic sensitivity that may modify the refractory period and conduction velocity in the re-entrant circuit (Köşüş et al., 2011). In summary, the changes that occur during pregnancy appear to make women more susceptible to arrhythmogenesis.

Theme Three: Conflicting Information on the Effect of Maternal Age on Cardiac Arrhythmias

Three studies reported on the impact of maternal age on the development of cardiac arrhythmias (Altun et al., 2014; Nikoo et al., 2014; Vaidya, et al., 2017). More specifically, two studies reported maternal age to have a non-significant impact on the incidence of cardiac arrhythmias (Altun et al., 2014; Nikoo et al., 2014), While Nikoo et al. (2014) reported QT prolongation in pregnancy, maternal age was found not to affect the heterogeneity of ventricular repolarization and propensity of ventricular arrhythmia. Similarly, Altun et al. (2014) found no relationship between maternal age and the probability of atrial fibrillations during gestation (Altun et al., 2014). Conversely, Vaidya et al. (2017) found that pregnant women aged between 41 and 50 reported an overall greater frequency of any arrhythmias (199 per 100,000 and 162% increase) compared to pregnant women aged 18 to 30 years of age (55 per 100,000 and 58% increase). Thus, the findings reported in the literature on the relationship between maternal age and the development of arrhythmias during pregnancy are inconsistent.

Synthesis of Evidence

This scoping review reported on the current literature on the development of cardiac arrhythmias among women during pregnancy or in the immediate postpartum period, who did not have any prior related significant medical history. The most common arrhythmia reported in the literature is related to different tachyarrhythmias, particularly the onset of SVT. The development of cardiac arrhythmias was reported during different stages of pregnancy. However, there was no literature that focused on women in their second or subsequent pregnancy experiencing this complication for the first time in the postpartum period.

Discussion

Based on the findings of our review, the three major themes identified were: 1) electrocardiography and cardiac findings; 2) hemodynamic, autonomic, and hormonal changes that occur in pregnancy; and 3) conflicting information regarding the effect of maternal age on cardiac arrhythmias. Included articles suggested the issue may be of global concern among healthy pregnant women of diverse ages.

The findings from this review indicate that previously healthy women may develop cardiac arrhythmias at various stages of gestation, although the evidence remains limited and inconsistent. Several discussion papers and studies reported specifically on the symptoms of SVT (Kugamoorthy & Spears, 2020; Li et al., 2008; Manolis et al., 2020). However, the prevalence of SVT among pregnant and postpartum women remains unclear. Moreover, the design, methods, and sample characteristics in the existing studies are inconsistent. There is also less focus on bradyarrythmias than tachyarrhythmias in this literature, which may be because sinus bradycardia is unusual in pregnant women. Therefore, future research should explore the prevalence, risk factors, and clinical implications of tachyarrythmias and bradyarrhythmias throughout the various stages of pregnancy.

Research to date supports the contention that hemodynamic, autonomic, and hormonal changes in pregnancy can be underlying mechanisms that lead to arrhythmia development. Substantial increases in maternal hormones like oestrogen and human chorionic gonadotropin (hCG) occur during pregnancy. Estrogen increases plasma catecholamine levels and adrenergic receptor sensitivity, both of which lead to an excessively activated sympathetic response (Hart et al., 2011; Holzman et al., 2009; Machuki et al., 2018). According to a review by Stavrakis et al. (2020), sympathetic hyperactivity raises the risk for ventricular arrhythmias and sudden death in pregnant women. However, the four sources included in this review contradicted the findings of Stavrakis et al. (2020) and found that these types of arrhythmias in normal pregnancy are idiopathic, showing a benign nature using an ECG monitor (Köşüş et al., 2011; Kugamoorthy & Spears, 2020; Li et al., 2008; Manolis et al., 2020). Moreover, only three available articles discussed the role of hormonal changes in pregnancy-related arrhythmias development. Therefore, further research related to hemodynamic, autonomic, and hormonal changes in pregnancy is needed.

This scoping review also revealed inconsistent findings and lack of evidence on the effects of maternal age on the development of cardiac arrhythmias during pregnancy in previously healthy women. Variations in study designs and sampling could have contributed to this, warranting the need for further exploration in this area. While the maternal age of mothers giving birth to their first child is increasing, this raises concerns regarding adverse complications during pregnancy that could affect both the mother and the fetus (Londero et al., 2019). Since numerous factors may affect the prevalence of arrhythmia in pregnancy, it is important to evaluate the possible effects of multiple factors. Further quantitative research is necessary to observe correlations between maternal age and the incidence of cardiac arrhythmia in pregnancy.

Limitations

Only 13 relevant articles that included the criteria for this review could be located; 10 were research based. As well, studies written in languages other than English may have been overlooked. However, as this is an emerging area of research, there is a high likelihood that this is representative of the number of studies that exist to date on this topic. Finally, although the interpretation of the literature deemed worthy of inclusion may have been subject to reviewer bias, this evaluation bias was minimized by four reviewers (KM, SF, KC, and PK) examining each of the articles.

Implications for Nursing

Pregnancy is associated with an increased risk for the development of arrhythmias (Conti et al., 2024; Soma-Pillay et al., 2016). Therefore, it is important for cardiovascular nurses to be aware of and assess pregnant women for this risk. Nurses providing care to pregnant women in different healthcare settings, including community, clinics and hospitals, must be aware of the potential risks of developing cardiac arrhythmias during pregnancy. This scoping review highlights various factors that can increase the likelihood of developing cardiac arrhythmias during pregnancy, including age, physiological changes during pregnancy, and hormonal fluctuations. Nurses must understand the risk assessment to ensure early detection and timely intervention. Education must be provided to ensure nurses caring for pregnant and postpartum women have the skills to assess their patients for possible cardiac arrhythmias. Patient care guidelines should include ongoing assessments of heart rate and rhythm during pregnancy and at postpartum care periods to ensure timely intervention and management (Conti et al., 2024).

This review highlights the prevalence of tachyarrhythmias in healthy pregnant women. In addition to the assessment of cardiac arrhythmias, nurses also play a crucial role in providing education to patients on the symptoms, risk factors, and when to seek medical attention. The management of cardiac arrhythmias during pregnancy and the postpartum period requires a collaborative approach, including nurses, physicians, pharmacists, electrophysiologists, and other healthcare professionals, to implement a comprehensive care plan, as well as further refine the existing practical guidelines to support this patient population. Nurses must facilitate effective communication among members of the interprofessional care team, as well as patients and their families, to ensure all healthcare professionals are well-informed and working toward providing patient-centred care for previously healthy pregnant or postpartum women with cardiac arrhythmias.

Our review highlights the importance of further research in this area. Future studies need to be mindful to include a detailed description of the demographic profiles of included participants to delineate any impact that sample diversity can have on arrhythmia development. As well, since this review determined that previous studies in this topic area utilized quantitative designs, more qualitative research should be conducted that explores participants' lived experiences of developing and living with cardiac arrhythmias.

Conclusion

The purpose of this scoping review was to to map existing evidence on cardiac arrhythmia development in previously healthy pregnant or postpartum women. Thirteen articles were included in this scoping review and revealed three themes. The literature reported on several different cardiac arrhythmias that were observed in previously healthy pregnant or postpartum women. Several studies attributed the development of arrhythmias to the hemodynamic, autonomic, and hormonal changes that occur during pregnancy. Nurses providing care to this population must be aware of this potential issue and ensure that regular assessments, as well as timely interventions, occur. Finally, inconsistent findings were reported on the relationship between maternal age and the risk of cardiac arrythmias. Therefore, future quantitative and qualitative research is needed to explore previously healthy women's lived experiences of a diagnosis of arrhythmias during pregnancy or the postpartum period.

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Delirium in the Cardiovascular Surgery Patient: An Overview for Cardiovascular Nurses

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Abstract

Delirium is a common complication in the post-operative period following cardiovascular (CV) surgery, with the incidence ranging from 8% to more than 50% of these patients. Post-operative delirium has been associated with an increased risk of morbidity, mortality, prolonged hospital length of stay, and increased healthcare spending. The number of patients affected by delirium following CV surgery can be expected to increase in the next few decades, as the "baby boomer" cohort ages, and with cardiovascular disease likely remaining a leading comorbidity for Canadians. Therefore, it is important for CV nurses to be knowledgeable about delirium, as early recognition and management are essential to recovery. The authors provide an overview of delirium in patients following CV surgery, including the pathophysiology, subtypes of delirium, diagnostic criteria, risk factors, the pharmacological and non-pharmacological treatments, screening tools, and nursing implications. We also include nursing recommendations for delirium prevention, screening, and management in these patients.

Keywords: cardiovascular surgery, delirium, postoperative, cognitive dysfunction

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Key Highlights

- Delirium is a common post-operative complication following CV surgery that is associated with negative patient and healthcare outcomes.
- Non-pharmacological strategies for delirium management should be prioritized.
- Treatment for delirium for CV surgery patients must be evidence-based and individualized, using current practice guidelines and relevant hospital policies.
- Additional research regarding prevention and treatment of delirium in the unique CV surgery population is warranted.

Delirium is classified as an acute neurocognitive condition, characterized by a disturbance in attention, awareness, and cognition that fluctuates in its course and symptom presentation (American Psychiatric Association [APA], 2013). Delirium is estimated to affect from 8% to more than 50% of individuals following cardiovascular (CV) surgery (Sanjanwala et al., 2020). While there is a discrepancy in the incidence of post-operative CV surgery delirium based on the screening tool used, research utilizing a valid screening tool reports an incidence of approximately 20% (Sanjanwala et al., 2020). Delirium is a multifaceted complication that leads to an increased risk of morbidity and mortality, prolongs hospital stays, and increases healthcare costs (APA, 2013; Ely et al., 2004; Jones et al., 2019; Rudolph et al., 2010; Vasilevskis et al., 2018).

Approximately 18% of Canada's population is 65 years and older (Statistics Canada, 2019). This percentage is expected to increase to 43% by 2068 (Statistics Canada, 2019). As cardiovascular disease (CVD) continues to remain a leading comorbidity for Canadians, more older adults may require CV surgery. Therefore, the need for increased knowledge of delirium following CV surgery is necessary to mitigate the immediate and long-term consequences associated with this post-operative complication.

Registered nurses (RNs) are in an optimal position to assess for delirium, given their ongoing patient care interactions (Koster et al., 2009). Education for RNs on epidemiology, screening, prevention, and treatment of delirium has been found to be effective in reducing the incidence and morbidity of delirium in post-operative patients (American Geriatrics Society [AGS], 2015). The purpose of this paper is to provide an overview of the current literature on delirium in patients following CV surgery, including the pathophysiology of delirium, diagnostic criteria, screening tools, consequences, non-pharmacological and pharmacological treatments, and nursing implications.

Pathophysiology

Delirium is a complex and multifactorial neurocognitive disorder associated with multiple disturbances in neurotransmitters, including reduced levels of acetylcholine and melatonin, increased levels of dopamine, norepinephrine, and/

or glutamate, and disturbances in serotonin, histamine, and Y-aminobutyric acid levels (Boss & Heuther, 2019). Delirium is also associated with fluctuating levels of inflammatory markers, including C-reactive protein, cytokines, interleukins, interferon, and TNF-α, all of which are purported to contribute to delirium by modifying cerebral blood flow, neurotransmission, and altering the blood-brain barrier to become more susceptible to oxidative stress. (Boss & Heuther, 2019; Maldonado, 2017).

Cardiovascular surgery patients commonly have CVD, as well as other co-morbidities, including diabetes mellitus, renal, and pulmonary diseases, which are also associated with physiological inflammation and oxidative stress (Zakkar et al., 2015). This may compound the effects of oxidative stresses inherent to the use of extracorporeal membrane circuits in cardiopulmonary bypass (CPB), which is necessary during most CV surgeries (Zakkar et al., 2015). Cardiopulmonary bypass is thought to cause delirium through the production of emboli either through the dislodgement of atherosclerosis calcium in the aorta via cross-clamping or air that is retained in the CPB circuit (Mattimore et al., 2023).

Researchers have shown that patients who developed delirium following CV surgery with CPB had increased levels of chemokines, (Rudolph et al., 2008) and low levels of catalase (CAT; Karlidag et al., 2006). Chemokines are cytokines that cause inflammatory markers to cross the blood brain barrier. Therefore, the brain becomes vulnerable to the effects of systemic inflammation caused by CV surgery (Rudolph et al., 2008). In addition, catalase protects the body from antioxidant stress. A reduction in CAT predisposes patients to oxidative stress (Karlidag et al., 2006) and increases their susceptibility to delirium.

The neuronal aging hypothesis is an important consideration with respect to delirium in older age groups. According to this hypothesis, the neurological changes that occur with aging increase susceptibility to sickness and stress (Maldonado, 2017). The neuronal aging hypothesis notes that aging causes alterations in cerebral blood flow, a decline in the number of neurons, neurotransmission changes, and decreased vascular reserve (Maldonado, 2017). One might, therefore, predict that incidence of delirium may be correlated with age. Findings by Jones et al. (2019) support this hypothesis, as they conducted a retrospective cohort study of CV surgery patients (N = 2,447) and found that delirium occurred in 22.9% of patients 75 years and older, increasing to 29.3% in those 85 years and older (Jones et al., 2019).

Risk Factors for Delirium Following Cardiovascular Surgery

Risk factors for delirium following CV surgery can be grouped into predisposing and precipitating categories (see Table 1). Predisposing risk factors include male gender, atrial fibrillation, previous cognitive impairment, depression, previous history of stroke, older age (> 65 years), peripheral vascular disease, and diabetes mellitus (Koster et al., 2011; Lin et al., 2012; Sanjanwala et al., 2020). Blood transfusions, abnormal albumin level, low cardiac output, use of an intra-aortic balloon pump (IABP), inotropic medications, prolonged CPB time, and prolonged mechanical ventilation time (> 12–24 hrs) have also been found to increase the risk of developing delirium (Koster et al., 2011; Muller Moran et al., 2019; O'Neal et al., 2017).

Researchers have also found that frailty increases the risk of delirium following CV surgery (Itagaki et al., 2020; Pozzi et al., 2023). For example, in a prospective observation study, Brown et al. (2016) assessed patients (N = 55) for frailty prior to CV surgery. They found that the patients who were deemed frail (47.1%), according to the validated frailty criteria by Fried et al. (2001), pre-operatively had a significantly higher incidence of delirium post CV surgery compared to non-frail patients ($p < .001$; Brown et al., 2016). Therefore, based on a patient's pre-operative frailty assessment, nurses and other healthcare providers can anticipate patients who are more likely to develop post-operative delirium following CV surgery.

Diagnostic Criteria

The diagnostic criteria for delirium are based on the APA Diagnostic and Statistical Manual of Mental Disorders (DSM; 2013). Key diagnostic features include acute onset, disturbance in attention, alterations in cognition and psychomotor function, and symptom fluctuations. Delirium may develop over hours or days, resulting in a change in baseline cognitive functioning. Patients may exhibit confusion, disorganized thoughts, changes in baseline behaviour, an inability to hold attention, and a fluctuation in level of consciousness. Disturbance in cognition alters speech, vision, and auditory capabilities. Importantly, the cognitive functioning

Table 1

Risk Factors for Post-operative Cardiovascular Surgery Delirium

Predisposing Risk Factors	Precipitating Risk Factors
Preoperative A-fibrillation	Abnormal albumin level
Previous cognitive impairment	Low cardiac output
Previous history of depression	Use of intra-aortic balloon pump (IABP)
Previous history of stroke or transient ischemic attack	Inotropic medication administration
Age > 65	Long cardio-pulmonary bypass (CPB) exposure
Peripheral vascular disease	Prolonged mechanical ventilation
Previous history of diabetes mellitus	History of blood transfusions
Frailty	

Note. From Brown et al., 2016; Jones et al., 2019; Koster et al., 2013; Lin et al., 2012; Muller Moran et al., 2019; O'Neal et al., 2017; Rudolph et al., 2009.

disturbances cannot be explained by a pre-existing or progressive neurocognitive condition, such as anxiety or dementia (APA, 2013).

Delirium encompasses three major subtypes: hyperactive, hypoactive, or mixed-level delirium (APA, 2013). Hyperactive delirium results in overactive motor activity that may include lability in mood and increased agitation. Hypoactive delirium is characterized by a low level of motor activity, accompanied by drowsiness and lethargy approaching a stupor-like state. In mixed-level delirium, patients may have no change or fluctuations in motor activity and experience a disturbance in their awareness or cognition (APA, 2013).

Specific to cardiac surgery, in a prospective cohort study, Stransky et al. (2011), found that 54 of 467 patients (12%) developed delirium following cardiac surgery, and of those who developed delirium, 42 (78%) had hypoactive delirium. Similarly, McPherson et al. (2013) found that hypoactive delirium was the predominant subtype in the Cardiovascular Intensive Care Unit (CVICU).

Screening Tools

Prompt recognition of delirium can reduce the adverse consequences and lead to improved patient outcomes (Evans et al., 2016). Therefore, it is imperative that CV nurses are aware of the rationale for using the various available delirium screening tools in their post-operative CV surgery patients.

Three widely used delirium screening tools are the Confusion Assessment Method (CAM; Inouye et al., 1990), the Confusion Assessment Method- Intensive Care Unit (CAM-ICU; Ely et al., 2001; see Figure 1), and the Intensive Care Delirium Screening Checklist (ICDSC; Bergeron et al., 2001, see Figure 2). The CAM-ICU and ICDSC are used with

Figure 1

Richmond Agitation-Sedation Scale (RASS)

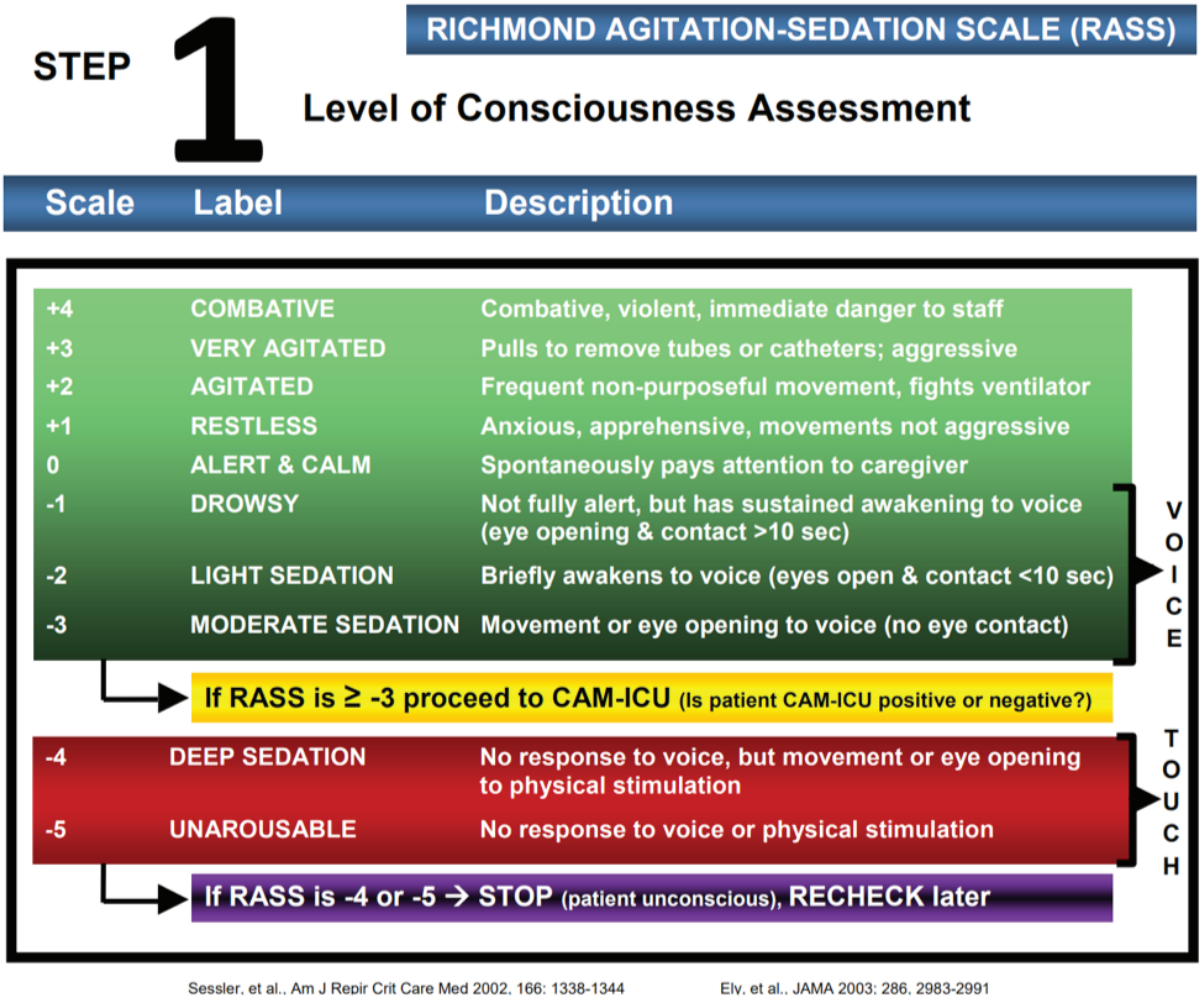

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Figure 2

Confusion Assessment Model (CAM)

CAM-ICU Worksheet

Feature 1: Acute Onset or Fluctuating Course	Score	Check here if Present
Is the patient different than his/her baseline mental status? OR Has the patient had any fluctuation in mental status in the past 24 hours as evidenced by fluctuation on a sedation/level of consciousness scale (i.e., RASS/SAS), GCS, or previous delirium assessment?	Either question Yes →	☐
Feature 2: Inattention		
Letters Attention Test (See training manual for alternate **Pictures**) Directions: Say to the patient, *"I am going to read you a series of 10 letters. Whenever you hear the letter 'A,' indicate by squeezing my hand."* Read letters from the following letter list in a normal tone 3 seconds apart. **S A V E A H A A R T** or **C A S A B L A N C A** or **A B A D B A D A A Y** **Errors are counted when patient fails to squeeze on the letter "A" and when the patient squeezes on any letter other than "A."**	Number of Errors >2 →	☐
Feature 3: Altered Level of Consciousness		
Present if the Actual RASS score is anything other than alert and calm (zero)	RASS anything other than zero →	☐
Feature 4:Disorganized Thinking		
Yes/No Questions (See training manual for alternate set of questions) 1. Will a stone float on water? 2. Are there fish in the sea? 3. Does one pound weigh more than two pounds? 4. Can you use a hammer to pound a nail? **Errors are counted when the patient incorrectly answers a question.** **Command** Say to patient: "Hold up this many fingers" (Hold 2 fingers in front of patient) "Now do the same thing with the other hand" (Do not repeat number of fingers) *If the patient is unable to move both arms, for 2nd part of command ask patient to "Add one more finger" **An error is counted if patient is unable to complete the entire command.**	Combined number of errors >1→	☐

Overall CAM-ICU		
Feature 1 plus 2 and either 3 or 4 present = CAM-ICU positive	**Criteria Met →**	☐ **CAM-ICU Positive** (Delirium Present)
	Criteria Not Met →	☐ **CAM-ICU Negative** (No Delirium)

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non-verbal ICU patients (Gusmao-Flores et al., 2012). Both scales incorporate the Richmond Agitation-Sedation Scale (RASS; Lough, 2014; see Figure 3) to assess agitation and sedation levels. Patients with a RASS score of -4 or -5, indicating deep sedation or coma, are excluded from continuing the use of the ICDSC and CAM-ICU tools (Lough, 2014).

The CAM tool consists of four categorical features derived from the DSM-3: Acute onset and fluctuating course, inattention, disorganized thinking, and altered level of consciousness (Inouye et al., 1990). The CAM-ICU tool is adapted from the original CAM scoring tool by Ely et al. (2001) for non-verbal or mechanically ventilated individuals. The ICDSC consists of eight items based on the DSM diagnostic criteria of delirium. A score greater than or equal to four supports a diagnosis of delirium (Lough, 2014).

According to Gusmao-Flores et al. (2012), the CAM-ICU has an 80.0% pooled sensitivity rating (95% CI, 77.1–82.6) and a 95.9% pooled specificity rating (95% CI, 94.8–96.8).

Figure 3

Intensive Care Delirium Screening Tool (ICDSC)

Alberta Health Services
Critical Care Strategic Clinical Network™

Intensive Care Delirium Screening Checklist

For any component of the checklist, if you are unable to assess, answer No = Score 0
A total ICDSC score greater or equal to 4 has a 99% sensitivity for a psychiatric diagnosis of delirium.

Score at time of assessment

Altered level of consciousness			**Assessment Considerations**
RASS = +1 to +4	Exaggerated response	Score = 1	Assess level of consciousness at the time of ICDSC scoring. May need to delay assessment if prn analgesic/sedation recently administered. For continuous sedation/long acting sedatives, score for patient's current condition.
RASS = 0	Normal wakefulness / calm / cooperative	Score = 0	
RASS = -1 to -2	Responds to mild stimulation	Score = 1	
RASS = -3	Responds to moderate stimulation	Score = 1	
RASS = -4 to -5	Responds only to intense repeated stimulation **OR** No response to noxious stimulation	**STOP ASSESSMENT**	

Inattention		**Assessment Considerations**
Difficulty following simple commands	Yes = Score 1	Attention needs to be held for a minimum of 10 seconds. Does the patient have the ability to organize their thoughts? Does the patient have difficulty focusing attention or difficulty tracking you? Ask the patient to hold up two fingers…and then ask them to hold up two more fingers. While spelling out "HAVE A HAART" get the patient to squeeze your hand on every "A", the patient needs to have 8/10 correct. Have the patient recite the months of the year backwards.
Attentive and focused	No = Score 0	
Unable to assess	No = Score 0	

Disorientation		**Assessment Considerations**
Disorientated to person, place or time	Yes = Score 1	For intubated patients use easy yes/no questions. Can the patient recognize family/caregivers? Do they know what kind of place they are in (hospital)?
Oriented or unable to assess	No = Score 0	

Hallucination, delusion or psychosis		**Assessment Considerations**
Visual, auditory or tactile hallucinations	Yes = Score 1	Hallucinations: Perception of something in the absence of stimuli. Delusions: False beliefs with no feasible/reasonable reason. Psychosis: Difficulty telling what is real and what is not. Do you hear someone speaking to you other than me? Do you see anything or anyone other than me? Do you believe someone is trying to harm you?
Delusions	Yes = Score 1	
Psychosis	Yes = Score 1	
No apparent hallucinations, delusion or psychosis or unable to assess	No = Score 0	

Observe throughout shift

Psychomotor agitation or retardation		**Assessment Considerations**
Agitation or retardation	Yes = Score 1	Hyperactivity: Heightened arousal. Can be restless, agitated or aggressive. Hypoactivity: Flat affect, withdrawn, decreased responsiveness, slowed speech, and/or apathetic.
Relaxed and cooperative or unable to assess	No = Score 0	

Inappropriate mood or speech		**Assessment Considerations**
Inappropriate mood, disorganized thoughts or inappropriate shouting	Yes = Score 1	Is the patient's speech or mood appropriate to the current situation? Is the patient inappropriately demanding? Consider asking family/friends if this is typical for the patient.
Appropriate speech/mood or unable to assess	No = Score 0	

Sleep wake cycle disturbance		**Assessment Considerations**
Slept more than 4 hours total during the day	Yes = Score 1	Based on primary caregiver assessment within the past 24hrs.
Slept less than 4 hours total during the night or frequent waking	Yes = Score 1	
Sleeping **at least 4 hours** at night or unable to assess	No = Score 0	

Fluctuations		**Assessment Considerations**
WORSENING of any indicators in the **last 24 hours** (see previous shift)	Yes = Score 1	Worsening of an indicator which is not related to an intervention. For example, patient is less rousable due to sedative for procedure.
No change or IMPROVEMENT of delirium indicators	No = Score 0	

Source: Bergeron N et al. Intensive Care Med 2001; 27: 869-64 Last Revised: June 2018 by CCSCN Delirium Initiative- ICDSC Working Group

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The ICDSC has a pooled 74% sensitivity (95% CI, 65.3–81.5) and an 81.9% specificity (95% CI, 76.7–86.4). In other words, the ICDSC and CAM-ICU tools are effective at ruling in and ruling out a diagnosis of delirium.

The 4 A's test is another tool that has been explored to screen for delirium in the clinical setting. This test consists of scoring a patient between zero to four on alertness, an abbreviated mental test, attention, and acute change or fluctuating course (Chang et al., 2023). This tool can be used by nursing staff at the bedside to assess for delirium. While scores between four and 12 indicate a positive screen for delirium, scores between one and three can indicate the presence of cognitive impairment, and a score of zero indicates that the presence of delirium is doubtful (Chang et al., 2023). In a recent single-centre, prospective observational study, Chang et al. (2023) evaluated the precision of the 4 A's test for delirium in post-operative CV surgery patients (N = 137). Based on their findings that the 4 A's test had a sensitivity of 85% (95% CI, 73–93) and a specificity of 90% (95% CI, 85–98), Chang et al. concluded that the 4 A's test was practical in ruling in or ruling out a diagnosis of delirium following CV surgery.

Consequences of Delirium

The consequences of delirium affect patients, family members, and health professionals. Delirium is considered a short-term neurocognitive syndrome that can be reversed. However, adverse long-term consequences may persist after hospital discharge (Rudolph et al., 2010). Delirium is associated with an increased risk of prolonged mechanical ventilation, longer hospital stay, falls, and an increased risk of functional decline and mortality following discharge (APA, 2013; Ely et al., 2004; Rudolph et al., 2010; Sanjanwala et al., 2020).

In a prospective cohort study (N = 190), Rudolph et al. (2010) found that delirium following CV surgery was a predictor of functional decline, with 36.3% (n = 65) of patients experiencing decline at one month, persisting to one year post-operatively in 14.6% (n = 26) of patients. The relative risk of functional decline in those diagnosed with delirium one month following cardiac surgery was 1.8 (95% CI, 1.2, 2.6) after correcting for age, comorbidities, and cognition level (Rudolph et al., 2010). In ICU settings, Ely et al. (2004) found that patients diagnosed with delirium had a greater six-month mortality rate than those not diagnosed with delirium (34% to 15%, p = .03). According to Sanjanwala et al. (2020), the long-term effects and complications associated with delirium can ultimately reduce one's quality of life following discharge.

Delirium not only adversely affects patients, but can also instill emotional hardships on nursing staff and family members. In a qualitative study by Schmitt et al. (2019), utilizing an interpretive description design, patients who had experienced delirium (n = 18), family members who witnessed their loved one experiencing delirium (n = 16), and nurses (n = 15) who provided care for patients experiencing delirium were interviewed on their experiences. Schmitt et al. (2019) concluded that delirium can lead to emotional strain on family members, as they may experience a loss of control when they witness loved ones with delirium, resulting in questions about the adequacy of patient care (Schmitt et al., 2019). Schmitt et al. also found that nurses feel helpless, emotionally drained, and inadequate due to the inability to effectively implement prescribed medical interventions and nursing care to these patients (2019).

Non-Pharmacological and Pharmacological Therapy

Numerous non-pharmacological interventions have been shown to prevent and treat delirium and are recommended by the Society of Critical Care Medicine (SCCM) and AGS guidelines. These interventions for delirium include**:** optimizing sleep by reducing external stimuli, light, and noise, early mobilization, and physical rehabilitation. Providing patients with their personal hearing aids and eyeglasses, reorientation, use of clocks, and reducing sedation are other beneficial measures (Devlin et al., 2018). Encouraging adequate fluid intake and nutrition, sleep hygiene, correct medication practice, adequate oxygenation, and bowel routine to prevent post-operative constipation are additional non-pharmacological strategies to prevent and treat delirium (AGS, 2015).

Delirium is associated with increased dopamine levels (Boss & Heuther, 2019). Therefore, pharmacological agents that inhibit dopamine release are the mainstays of treatment. These include typical and atypical antipsychotics, as well as alpha-2-adrenergic agonists. Haloperidol, which is a typical antipsychotic, is the most often used medication to treat delirium (Leigh et al., 2019). However, because it is known to prolong the QT-interval and is associated with the development of ventricular arrhythmias (Peretto et al., 2014), it should be used with caution in post-operative CV surgery patients. As such, atypical antipsychotics, such as olanzapine and quetiapine are favoured, as they, too, inhibit dopamine release in the cerebral cortex (Woo, 2020).

While dexmedetomidine is an alpha-2-adrenergic agonist, which provides sedation without suppression of the respiratory drive, its common side effects of hypotension and bradycardia limit its use in clinical practice (Wang et al., 2018). However, in a systematic review and meta-analysis (N = 18 randomized control trials [RCTs]; 1,730 patients), Wang et al. (2018) found that some studies indicate that dexmedetomidine may reduce the incidence of post-operative delirium and may not increase the occurrence of hemodynamic side effects following CV surgery. Conversely, the SCCM does not recommend using dexmedetomidine as a pharmacological agent in preventing ICU delirium (Devlin et al., 2018). While additional RCTs are needed to verify these findings

(Wang et al., 2018), nurses caring for CV surgery patients on dexmedetomidine must be aware of the adverse side effects associated with this medication.

The current guidelines published by the SCCM and AGS only provide recommendations for critical care patients and general post-operative patients. The AGS guidelines (2015) suggest that nonpharmacological management strategies should be prioritized in all patients with delirium, while atypical antipsychotics should be used as the first line for pharmacological treatment of post-operative delirium only in patients who are agitated or in severe distress. In addition, the AGS (2015) suggests that only atypical, not typical, antipsychotics should be administered for post-operative delirium, and this should be at the lowest dose for the shortest duration. However, recent guidelines from the SCCM differ from the AGS, as they advise against routinely using both typical and atypical antipsychotics to treat delirium in critically ill patients and advise using typical and atypical antipsychotics only in the setting of a patient at risk for harming themselves or others (Devlin et al., 2018). Instead, the SCCM recommends using dexmedetomidine for delirium treatment in mechanically ventilated adults in whom delirium impedes the weaning and extubation processes (Devlin et al., 2018). Therefore, there is currently no one pharmacological agent that is most recommended in the treatment of delirium.

In summary, initial management of delirium should be based on treating identified modifiable risk factors and comorbid illnesses, as well as non-pharmacological interventions, such as optimizing sleep (AGS, 2015), instead of administrating antipsychotics as monotherapy (Arora & Kehler, 2020). Moreover, the approach to pharmacological treatment for delirium should be deferred to the responsible clinician, individualized to the specific patient, and based on evidence-based practice, current practice guidelines, and relevant hospital policies.

Implications for Practice

Critical care and cardiovascular nurses play a fundamental role in preventing, detecting, and managing delirium. It is important for nurses to have sufficient knowledge of delirium, as it has been shown that additional education provided to healthcare providers is associated with lower rates of post-operative delirium (AGS, 2015). Moreover, early detection and management of post-operative delirium reduces the risk of delirium-associated complications, improves patient safety, and facilitates a faster return to baseline cognitive functioning (Fraser et al., 2018).

Following CV surgery, patients are intubated, non-verbal, and experience challenges communicating. It can be difficult for nurses to identify delirium, especially when the patient is experiencing the predominant subtype of hypoactive delirium (Lough, 2014). Therefore, standardized, routine delirium screening and monitoring are important for CV surgery patients. Screening is particularly important for those who have predisposing risk factors for delirium and for those who have multiple comorbidities (Mattison, 2020). Given the risk factors for post-operative CV surgery delirium it is especially important to screen older adults who are deemed frail (Brown et al., 2016). Importantly, as per the SCCM recommendations, routine delirium screening of ICU patients should include the use of a valid screening tool (Devlin et al., 2018).

Registered nurses are the primary care providers for post-operative CV surgery patients and, as such, are responsible for implementing nonpharmacological and pharmacological interventions for patients experiencing delirium. However, it is important that the management of delirium is not exclusively determined by the bedside RN, as it is a shared and collaborative responsibility among all healthcare team members and should also include discussions with family members, as appropriate. Multidisciplinary action utilizing non-pharmacological interventions to prevent and treat delirium is recommended (AGS, 2015; Devlin et al., 2018). Delirium prevention and management strategies should be routinely discussed during multidisciplinary patient rounds and change of shift reports. Nurses are also well situated to lead quality improvement initiatives targeting prevention and the reduction of delirium-related complications.

There is currently a dearth of published nursing research on delirium in CV surgery patients. Future nursing research, especially qualitative research that explores patient and family experience, as well as the experiences of nurses caring for post-operative CV surgery patients experiencing delirium is warranted. In addition, further research regarding the prevention and non-pharmacological and pharmacological treatment of delirium is necessary, as delirium in CV surgery patients is unique from other patient populations.

Conclusion

The issue of delirium in the post-operative CV surgery environment will likely increase in the future due to the aging population and the increasing prevalence of CVD. The consequences of delirium including increased morbidity, mortality, and functional decline are detrimental to patients, families, and the healthcare system. Therefore, it is critically important for CV nurses to be well-informed about effective strategies for prevention and early and accurate detection, as well as optimal treatment, based on current practice guidelines. Finally, further research, particularly from the nursing perspective, is needed to reduce the incidence, minimize the negative consequences, and optimize the outcomes of delirium in the CV surgery population.

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Transradial versus Transfemoral Artery Access in Cardiac Catheterizations: An Overview

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Abstract

Cardiac catheterization procedures, such as coronary angiography (CA) and percutaneous coronary intervention (PCI), are crucial for diagnosing and managing cardiovascular diseases. These procedures are currently performed using both radial and femoral arteries as vascular access sites. However, the transradial approach has gained popularity because of its association with reduced bleeding and mortality. Although recent evidence supports the use of the transradial approach as the default method for CA and PCI, femoral access remains preferable in specific cases. Because nurses are responsible for providing care to patients undergoing both CA and PCI procedures using either approach, knowledge of the differences in risks, complications, and nursing considerations of these procedures is important for the provision of quality nursing care. This overview highlights the key differences between transradial and transfemoral approaches, focusing on specific risks and complications and the nursing implications for these approaches to cardiac catheterization procedures.

Keywords: cardiac catheterization, coronary angiography, percutaneous coronary intervention, complications, transradial access, transfemoral access, nursing management

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Key Highlights

- As CVD remains the leading cause of death globally, high volumes of cardiac catheterization procedures are performed in both the United States and Canada.
- The transradial approach for cardiac catheterization has shown significant benefits and less complications compared with the transfemoral approach.
- Transfemoral access is still preferable and appropriate for some specific cardiac catheterization procedures, including those in which radial access is not possible and those that require large bore access.
- Awareness of the specific nursing considerations for the transfemoral and transradial approaches will enable cardiovascular nurses to provide optimal, individualized care to this patient population.

Introduction

Cardiac catheterization procedures, including coronary angiography (CA) and percutaneous coronary intervention (PCI), are fundamental for the diagnosis and treatment of a broad range of structural and functional cardiovascular diseases, including coronary artery disease (CAD), cardiac arrhythmias, valvular heart disease, congenital heart disease, and heart failure (Khin, 2020; Manda & Baradhi, 2023). Cardiovascular disease remains the leading cause of death globally (World Health Organization [WHO], 2021). Accordingly, cardiac catheterization procedures are commonly performed in both the United States and Canada with annual volumes of more than 1,000,000 (Virani et al., 2020), and 47,000 (Canadian Institute for Health Information, 2017) respectively.

The cardiac catheterization procedure involves the insertion and advancement of a radiopaque catheter through a vein or artery to either the left or the right side of the heart (Khin, 2020). Both CAs and PCIs require arterial access, which is usually achieved through either the radial or femoral artery (Shroff & Pinto, 2019). Over the past two decades, a growing body of evidence has supported the use of the transradial approach for CA and PCI because of the reduced risk of bleeding complications and mortality (Bajraktari et al., 2021; Batra et al., 2020; Bhat et al., 2017; Chiarito et al., 2020; Ferrante et al., 2016; Gargiulo et al., 2022; Jolly et al., 2011; Ng et al., 2021). Thus, the use of radial access for CA and PCI has become increasingly common, and many catheterization laboratories have adopted this approach as their default access method (Bangalore et al., 2021; Feldman et al., 2013; Naidu et al., 2021; Reifart et al., 2022; Shamkhani et al., 2023; Wong et al., 2019). However, femoral access is still required for specific patients and procedures; for example, where radial access is not possible, and cardiac catheterization procedures that require large-bore access (Shroff & Pinto, 2019).

Cardiovascular nurses are often the key members of the healthcare team responsible for caring for patients undergoing cardiac catheterizations. With the high volumes of PCIs being performed in the United States and Canada,

these nurses are likely to continue to encounter numerous patients undergoing these procedures using both the transfemoral and transradial approaches. Therefore, the aim of this overview is to inform cardiovascular nurses about the advantages and disadvantages of transradial and transfemoral approaches for CA and PCI, with a focus on identifying the unique risks and nursing management for patients undergoing these procedures.

Femoral Versus Radial Artery Access Approaches

The femoral and radial arteries are the two most common and preferred sites for CA and PCI, respectively (Shroff & Pinto, 2019), with advantages and disadvantages to both approaches. Although several complications are common to both, certain complications are specific to the access approach. Therefore, it is vital for nurses to be aware of the advantages and disadvantages of both access site approaches. The following section discusses these advantages and disadvantages, including the risks of specific complications, of the femoral and radial access approaches.

Femoral Artery Access Approach

The percutaneous transfemoral access approach was introduced by Judkins in 1967 (Judkins, 1967). Since then, the femoral artery has been routinely used for CA and PCI procedures and remains the preferred access site in emergent cases, patients with ST elevated myocardial infarction (STEMI), elderly patients (Yee et al., 2017), and in patients with absent or difficult-to-palpate radial and brachial pulses (Anjum et al., 2017). The size and location of the femoral artery are the two primary advantages of the transfemoral approach (Shroff & Pinto, 2019). Due to its large size, the femoral artery can be easily palpated and allows for the use of large sheaths and catheters, which remain necessary in some cardiac catheterization procedures (Anjum et al., 2017; Shroff & Pinto, 2019). The location of the femoral artery also allows it to be easily compressed against the femoral head for post-procedural hemostasis (Shroff & Pinto, 2019).

The main disadvantage of the transfemoral versus transradial approach is its association with an increased incidence of several complications. The risk of bleeding and large hematoma formation (Bajraktari et al., 2021; Bhat et al., 2017; Brener et al., 2017; Chiarito et al., 2020; Jolly et al., 2011). As well, the incidence of pseudoaneurysm and arteriovenous fistula formation is reported to be higher with the transfemoral approach than with the transradial approach (Brueck et al., 2009; Jolly et al., 2011). In addition, the risk of all-cause mortality increases with the transfemoral approach versus the transradial approach in patients with acute coronary syndrome and STEMI (Bernat et al., 2014; Jolly et al., 2011; Romagnoli et al., 2012; Valgimigli et al., 2015). Although rare (0.06%), retroperitoneal hemorrhage is a life-threatening bleeding complication that can occur as a consequence of the transfemoral approach (Kwok et al., 2018).

Radial Artery Access Approach

The transradial approach to CA was first reported by Campeau in 1989 (Campeau, 1989) and has since demonstrated several advantages over the transfemoral approach, including a significantly reduced risk of vascular complications, major bleeding, all-cause mortality, and major adverse cardiovascular events (Batra et al., 2020; Bhat et al., 2017; Brener et al., 2017; Ferrante et al., 2016; Gargiulo et al., 2022; Jolly et al., 2011; Ng et al., 2021; Reifart et al., 2022). Additionally, the radial artery can be easily palpated, punctured, and compressed to control bleeding (Anjum et al., 2017). The absence of major nerves and veins near the radial artery also makes it a favourable access site, as it minimizes the risk of nerve and vascular injuries (Anjum et al., 2017). For these reasons, transradial access is preferred in diagnostic catheterization (Gladden et al., 2022; Yee et al., 2017), in morbidly obese patients (BMI ≥ 35), and in patients less than 70 years of age (Yee et al., 2017).

Despite its advantages over the transfemoral approach, the transradial access has several disadvantages. Vascular access may be complicated by the small diameter of the radial artery and the potential for anatomical variation (Shroff et al. 2019). The radial artery can also become occluded because of endothelial damage from sheath insertion and thrombus formation (Alkagiet et al., 2021; Avdikos et al., 2017; Kotowycz & Džavík, 2012; Roy et al., 2022). This complication is often asymptomatic due to the hand's dual vascular supply and, consequently, it is commonly underdiagnosed (Alkagiet et al., 2021; Avdikos et al., 2017; Roy et al., 2022). Finally, radial artery perforation is rare and most common in elderly women who typically have narrow and tortuous arteries (Alkagiet et al., 2021). If not managed properly, this complication can lead to significant bleeding, hematoma, and compartment syndrome (Alkagiet et al. 2021; Roy et al. 2022; Sandoval et al. 2019).

Nursing Considerations

Nurses practising in various clinical areas play a central role in providing care to patients undergoing cardiac catheterization. Several key nursing considerations vary based on whether the patient has undergone cardiac catheterization with the transfemoral or the transradial approach. Therefore, nurses caring for these patients must be knowledgeable about these specific differences, so they can provide appropriate care for each unique patient. Table 1 summarizes the differences in nursing considerations based on access approach.

Regardless of the access approach, pre-procedural nursing care generally includes completing a nursing assessment, reviewing allergies, confirming fasting time, administering medications, and obtaining necessary preprocedural

Table 1

Summary of Specific Evidence-Based Best Practice Guidelines and Nursing Considerations for Transfemoral vs Transradial Cardiac Catheterization Patients

	Transfemoral Approach	Transradial Approach
Pre-procedural Nursing Considerations	Mark the best sites for palpation of the dorsalis pedis, and posterior tibial pulses.[2]	Inform the patient that they can ambulate once recovered from sedation.[2]
	Inform the patient of the expected length of bedrest after the catheterization: 4-6 hrs.[2]	
Post-procedural Nursing Considerations	Bedrest for 4–6 hours.[2]	Patient can ambulate after recovered from sedation.[2]
	Head of bed may be elevated to max of 30°.[2]	Instruct patient to avoid flexing, hyper flexing, or lying on the affected arm for 24 hrs.[2]
	Instruct patient not to flex or hyperextend the hip joint of the affected leg for 4–6 hrs.[2]	Monitor for signs of arterial occlusion: blanching, cramping, coolness, pain, numbness, tingling, or absent/diminished pulse.[2]
	If compression device applied, monitor peripheral pulses as per protocol.[2]	If signs of arterial occlusion occur, first check the compression device (if used) and release pressure. If symptoms do not resolve, notify the provider immediately.[2]
	Monitor for signs of retroperitoneal hemorrhage: back, flank, or abdominal pain, hypotension, tachycardia, restlessness, agitation.[3]	Monitor for signs of radial artery perforation and notify provider immediately if they occur: lost/weakened pulse distal to sheath insertion site, cool, cyanotic, and painful extremity.[3]
	Bleeding can be managed with application of pressure for 15–20 minutes either manually or with a compression device:[2]	Bleeding can be managed with application of pressure for 15–20 minutes either manually or with inflation of a transradial band.[2]
Discharge Teaching	Avoid straining during bowel movements for the first 3–4 days post-procedure.[1]	Avoid flexing, hyper flexing, or lying on the affected arm for 24 hrs and do not lift anything heavier than 5lb for the next 48 hrs.[2]
	Avoid strenuous activities (most sports, jogging, golfing, etc.) for 5 days post-procedure.[1]	Avoid strenuous activities (most sports, jogging, golfing, etc.) for 2 days post-procedure.[1]
	Avoid heavy lifting (>10 lbs) for the first 5–7 days post-procedure.[1]	
	Limit excessive stair climbing;[2] if necessary, do stairs slower than usual.[1]	

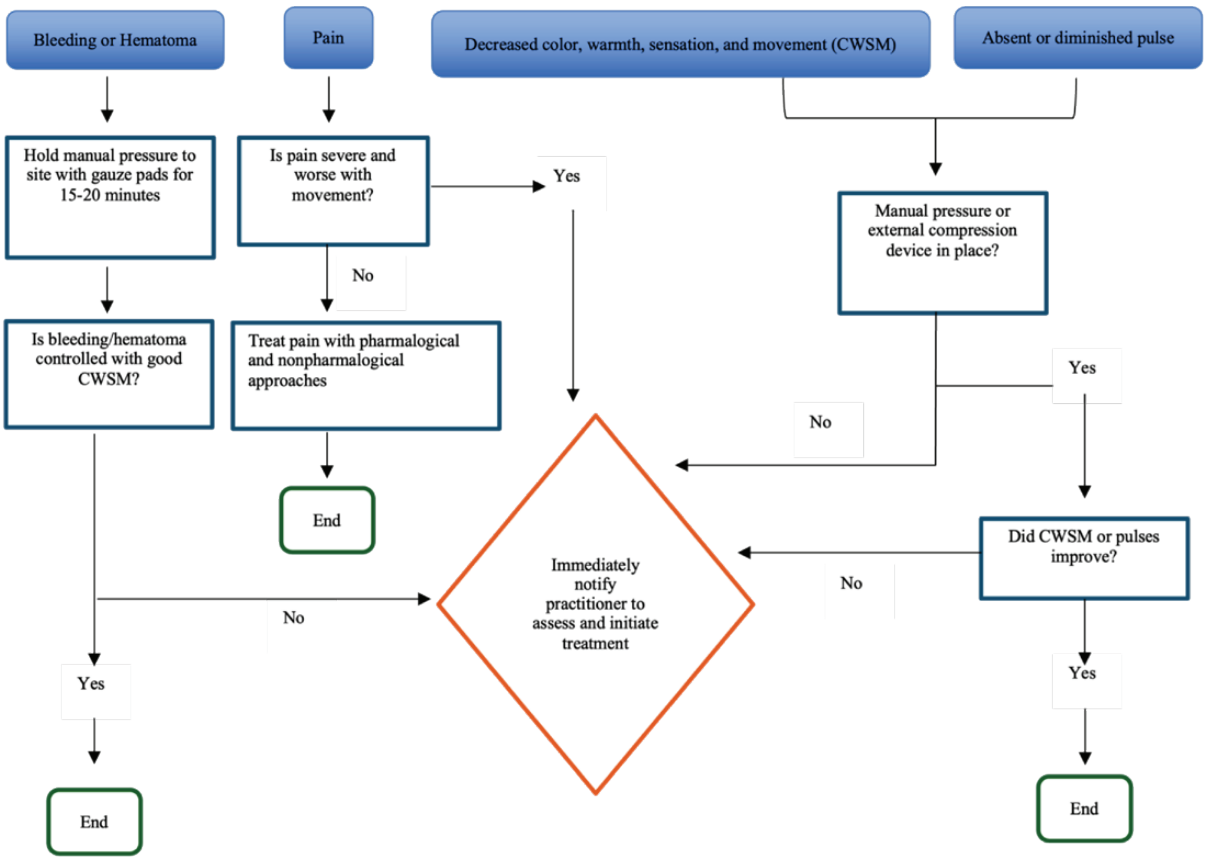
Note: [1] Cleveland Clinic (n.d.); [2] Julien, 2021; [3] Then & Rankin, 2020.

laboratory studies as ordered by the interventionalist, (Julien, 2021; Naidu et al., 2021). If the transfemoral approach is being used, the sites for best palpation of the dorsalis pedis and posterior tibialis pulses are marked on the patient's skin for comparison to evaluate peripheral pulses after the procedure (Julien, 2021). In addition to general patient teaching aimed at preparing patients for catheterization experiences and alleviating anxiety, specific explanations for patients scheduled for a transfemoral procedure should include the expected duration of post-procedure bedrest; between 4–6 hours (Julien, 2021).

Postprocedural nursing care for all cardiac catheterization patients focuses on monitoring the patient, preventing and identifying potential complications (see Figure 1), and providing discharge teaching (Julien, 2021). Although unit protocols dictate specific time intervals, frequent monitoring of patients' vital signs and assessment of the access site and corresponding limb are central to post-procedural nursing care for all patients (Julien, 2021; Lippincott Procedures, 2023a; Lippincott Procedures, 2023b). However, activity restrictions depend on the access approach. Patients who have undergone catheterization with the transfemoral approach should maintain bedrest, with the head of the bed elevated no more than 30 degrees and avoid flexion and hyperflexion of the hip joint of the affected leg for 4 to 6 hours post-procedure (Julien, 2021). Patients who have undergone catheterization with the transradial approach can ambulate once recovered from sedation and should be instructed to avoid flexing, hyper flexing, or lying on the affected arm for 24 hours (Julien, 2021).

Figure 1

Nursing Pathway for Managing Potential Post-Procedural Complications



Adapted from: Lippincott Procedures. (2023a) Left heart catheterization postprocedure care. Retrieved December 27, 2023 from https://procedures-lww-com.ahs.idm.oclc.org/lnp/view. do?pId=6695604&hits=catheterization,cardiac&a=true&ad=false&q=cardiac%20catheterization, Lippincott Procedures. (2023b) Neurovascular assessment. Retrieved from https://procedures-lww-com.ahs.idm.oclc.org/lnp/view.do?pId=4181558

An important role of nurses in post-procedural care is to monitor for access-specific complications. Because retroperitoneal hemorrhage is a potential life-threatening complication that can occur with the transfemoral approach (Kwok et al., 2018), nurses must be particularly diligent in assessing for the signs and symptoms of this complication, including back, flank, or abdominal pain, hypotension, tachycardia, restlessness, and agitation (Then & Rankin, 2020). Nurses must also be aware of the urgency in managing this complication, which includes notifying the provider and anticipating administering IV fluids, stopping anticoagulant therapy, and preparing the patient for diagnostic testing and/or further intervention (Then & Rankin, 2020).

Likewise, nurses must be diligent in monitoring for complications of the transradial approach, including signs of radial artery occlusion (i.e., blanching, cramping, coolness, pain, numbness, tingling, or an absent/diminished pulse in the affected extremity; Julien, 2021), especially because initially it is often asymptomatic (Alkagiet et al., 2021; Avdikos et al., 2017; Roy et al., 2022). Assessing for potential signs of radial artery perforation including, coolness, cyanosis, pain, and lost/weakened pulse distal to the insertion site in the affected extremity (Julien, 2021) is also critically important in patients who have undergone catheterization using the transradial approach because it can lead to significant bleeding, hematoma, and compartment syndrome (Alkagiet et al., 2021; Roy et al., 2022; Sandoval et al., 2019).

Finally, standard discharge teaching for all cardiac catheterization patients includes informing their physician if they experience fever, new bleeding, swelling, increased

tenderness, redness, or discharge at the catheterization site, instructing them to manage bleeding by pressing their hand firmly over the site and calling 911, and instructing them to continue taking prescribed medications unless otherwise indicated by their provider (Julien, 2021). However, unique discharge instructions are also required for patients who have undergone the procedure using the transfemoral approach versus the transradial approach (Julien, 2021). Patients who have undergone catheterization with the transfemoral approach should be instructed to avoid straining during bowel movements for the first three to four days, avoid strenuous activity (e.g., most sports, jogging, golfing, etc.) for five days, and avoid heavy lifting (>10 lbs) for the first five to seven days after the procedure (Cleveland Clinic, n.d.). Patients should also be instructed to avoid excessive stair climbing (Julien, 2021); if necessary, patients can climb stairs, but they should be instructed to do so slower than usual (Cleveland Clinic, n.d.). Unique discharge instructions for transradial approach patients include instructing the patient to avoid flexing, hyperflexing, or lying on the affected arm for 24 hours, and not lifting anything heavier than 5 lbs for 48 hours post-catheterization (Julien, 2021). Additionally, patients should avoid strenuous activity for two days after the procedure (Cleveland Clinic, n.d.).

Conclusion

The development of the transradial approach to CA and PCI has significantly improved patient outcomes by reducing the risk of vascular complications, major bleeding, and mortality compared to the transfemoral approach. Although these factors have contributed to a growing preference for the default use of the transradial approach, the transfemoral approach is still necessary in some cardiac catheterization procedures. As both access sites are used for cardiac catheterization, awareness of the advantages, disadvantages, complications, and differences in nursing considerations of each approach will enable nurses to provide optimal care to patients undergoing cardiac catheterization procedures.

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Canadian Nurses Association Certification Program

What is Certification?

CNA certification is a nationally recognized nursing specialty credential for nurses. The CNA Certification Program consists of 22 nursing practice specialties. Earning this credential shows your employer, peers and clients that you are a dedicated professional committed to lifelong learning, patient advocacy and professional practice. Certification is a great way to demonstrate your continuing competence in your nursing specialty. It can also help you fulfil some of the quality assurance program requirements of your employer and/or licensing body.

By becoming certified, you are:

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- staying current with your cardiovascular nursing knowledge through preparation for the exam and through continuous learning for certification renewal. On successful completion of the certification process you will be able to use the trademarked designation of CCN(C) and join a growing number of more than 17,500 Canadian nurses who have become certified in 20 specialties

To learn more, visit **What is Certification? – Canadian Nurses Association**

2025 Important Dates:

Spring exams

- Applications are accepted by CNA between January 15–March 3, 2025
- Exam writing window: May 1–15, 2025
- Receive your results in June 2025

Fall exams

- Applications are accepted by CNA between June 16–September 30, 2025
- Exam writing window: November 1–15, 2025
- Receive your results in December 2025

Renewal by continuous learning

- Applications are accepted by CNA anytime between January 15–December 15, 2025

CCCN has developed multiple tools and resources to help support your CNA certification journey including a Cardiovascular Nursing Preparation Guide, Webinars and Study Group.

Please visit the CCCN website – section **Certification** – for more information.

Programme de certification de l'AIIC

Qu'est-ce que la certification ?

La certification de l'AIIC confère aux infirmières et infirmiers une désignation dans une spécialité infirmière reconnue à l'échelle nationale. Le Programme de certification de l'AIIC comprend 22 spécialités de pratique des soins infirmiers. L'obtention de cette désignation démontre à votre employeur, vos pairs et vos clients que vous vous dévouez sur le plan professionnel envers l'apprentissage continu, la défense des intérêts des patients et la pratique professionnelle. La certification est un excellent moyen de démontrer votre compétence continue dans votre spécialité infirmière. Elle peut aussi vous aider à atteindre certaines des exigences du programme d'assurance de la qualité de votre employeur ou organisme de réglementation.

En obtenant la certification, vous êtes :

- reconnus à l'échelle nationale pour l'excellence dans votre pratique et votre engagement envers l'apprentissage continu;
- recherchés par de nombreux employeurs, parce que votre certification démontre des connaissances spécialisées et apportent de nombreux avantages aux organisations;
- perçus comme ayant une plus grande crédibilité professionnelle
- au courant des connaissances en sciences infirmières cardiovasculaires en vous préparant à l'examen et en suivant une formation continue pour le renouvellement de la certification. Une fois le processus de certification terminé avec succès, vous pourrez utiliser la marque déposée CCN(C) et rejoindre un nombre croissant de plus de 17 500 infirmières et infirmiers canadiens qui ont obtenu la certification dans 20 spécialités.

Pour en savoir plus, consultez la page : **Qu'est-ce que la certification ? – AIIC**

2025 dates importantes :

Examens du printemps

- L'AIIC accepte les demandes d'inscription entre le 15 janvier et le 3 mars 2025.
- Fenêtre d'inscription à l'examen : Du 1er au 15 mai 2025
- Réception des résultats en juin 2025

Examens d'automne

- Les candidatures sont acceptées par l'AIIC entre le 16 juin et le 30 septembre 2025.
- Fenêtre d'écriture des examens : Du 1er au 15 novembre 2025
- Réception des résultats en décembre 2025

Renouvellement

- L'AIIC accepte les demandes de renouvellement entre le 15 janvier et le 3 mars 2025.

Le CCIISC a mis au point de nombreux outils et ressources pour vous aider dans votre parcours de certification AIIC, notamment un guide de préparation aux soins infirmiers cardiovasculaires, des webinaires et un groupe d'étude.

Veuillez consulter le site web du CCIISC – section **Certification** – pour de plus amples informations.

Newly Certified and Recertified Cardiovascular Nurses

Elham Amini, *Burnaby, BC*
Ann Gisel Balangue, *Calgary, AB*
Brooke Bowles, *Saskatchewan*
Caitlin Brown, *Vancouver, BC*
Rocelle Mary Joy Cacayan, *Timberlea, NS*
Julie Chasse, *Noonan, NB*
Cinthia (Cindy) Cioban, *Prince George, BC*
Julie Coughran, *New Maryland, NB*
Elizabeth Dyck, *Edmonton, AB*
Victoria Frizzell, *Moncton, NB*
Michelle Gartner, *Saskatoon, SK*
Ann Gibb, *Vancouver, BC*
Kelly Gould, *New Brunswick*
Blythe Gregorio, *Ontario*
Tammy Hardy-MacDonald, *Conception Bay, South, NL*
Kwang-Soon Jeon, *Ontario*
Mélanie Kappel, *Oro-Medonte, ON*
Chandell Kelly, *Vancouver, BC*
Alexa Komlos, *West Vancouver, BC*
Ebony Lees, *Vancouver BC*
Stefanie MacLeod, *British Columbia*
Karen McNalley, *Wainwright, AB*
Katrina Joyce Mesina, *Burnaby, BC*
Allison Munro, *Abbotsford, BC*
Mica Nowak, *New Brunswick*
Kristen Parks, *Oromocto, NB*
Lori Penner, *Saskatchewan*
Lana Pogue, *British Columbia*
Regan Rawson, *Ontario*
Noreen Rozani, *Burnaby, BC*
Jodi St-Gelais, *Vancouver, BC*
Kristy Strecko, *Cumberland, ON*
Abby Swanson, *Vancouver, BC*
Maria Taylor-Carrier, *Calgary, AB*
Meghan Totten, *Fairfield, NB*
Eric Tu, *Vancouver, BC*
Dianne Marie Volante, *Edmonton, AB*
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