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CLINICAL COLUMN

Heart Sounds: Are You Listening? Part 2

Jocelyn Reimer-Kent, RN, MN

Abstract

The first of this two-part article on heart sounds was in the Spring 2013 issue of the Canadian Journal of Cardiovascular Nursing (Reimer-Kent, 2013). Part 1 emphasized the importance of all nurses having an understanding of heart sounds and being proficient in cardiac auscultation. The article also focused on an overview of the fundamentals of cardiac auscultation and basic heart

sounds. This article provides an overview of the anatomy and pathophysiology related to valvular heart disease and describes the array of heart sounds associated with stenotic or regurgitant aortic and mitral valve conditions.

Key words: valvular heart disease pathophysiology, systolic murmurs, diastolic murmurs, aortic stenosis, mitral stenosis, aortic regurgitation, mitral regurgitation

Anatomy of the Aortic and Mitral Valves

Understanding normal valve anatomy is foundational to understanding abnormal heart sounds associated with valvular heart disease. Figure 1 illustrates the four cardiac valves. Emphasis in this article is on the mitral valve (MV), also known as an atrioventricular valve and the aortic valve (AV), also known as a semilunar valve. Valve orifices (annulus) are formed from the fibrous skeleton of connective tissue that separates the atria and ventricles.

Connected to the AV annulus are three half-moon-shaped cusps, which are named according to the proximity of their respective coronary arteries (i.e., left coronary cusp, right

coronary cusp, and non-coronary cusp). When open the AV measures approximately 3 to 4 cm² (Bonow et al., 2006; Cary & Pearce, 2013; Klabunde, 2011).

Connected to the MV annulus are the anterior and posterior leaflets. Unlike the attachment free AV, the MV is a sophisticated structure. The leaflets are attached to chordae tendineae, which are connected to papillary muscles, which anchor the entire valve to the left ventricular wall. For the MV to function properly, there needs to be integrity among all of these components. When open, the MV area measures approximately 4 to 5 cm² (Bonow et al., 2006; Klabunde, 2011; Turi, 2004).

Systolic and Diastolic Murmurs

Skilled clinicians can diagnose the cause of a heart murmur by pinpointing the sound in relation to its timing within the cardiac cycle, location, radiation, and intensity. To discern the significance of a murmur requires critical thinking on the part of the practitioner and correlating the findings with the patient's appearance and history. Murmurs arise from stenotic (obstructive) or regurgitant (incompetent) valve conditions, abnormal connections between right and left heart circulations, and conditions that obstruct flow across the valve that mimic stenosis such as a left atrial myxoma. Functional systolic and diastolic murmurs can develop as the heart adapts to stenotic or regurgitant states. Innocent systolic flow murmurs can also develop from high output states (e.g., pregnancy) (Alpert, 1990; Choudhry & Etchells, 1999; Crawley, 1990; Curtin, & Griffin, 2010; Turi, 2004; University of California San Diego, 2008; University of Washington, n.d.).

To distinguish the timing of the murmur within the cardiac cycle (systole or diastole), palpate the carotid pulse or observe the cardiac rhythm as outlined in Part 1 (Reimer-Kent, 2013). A systolic murmur is heard between the first heart sound (S₁) and the second heart sound (S₂) and accompanies aortic

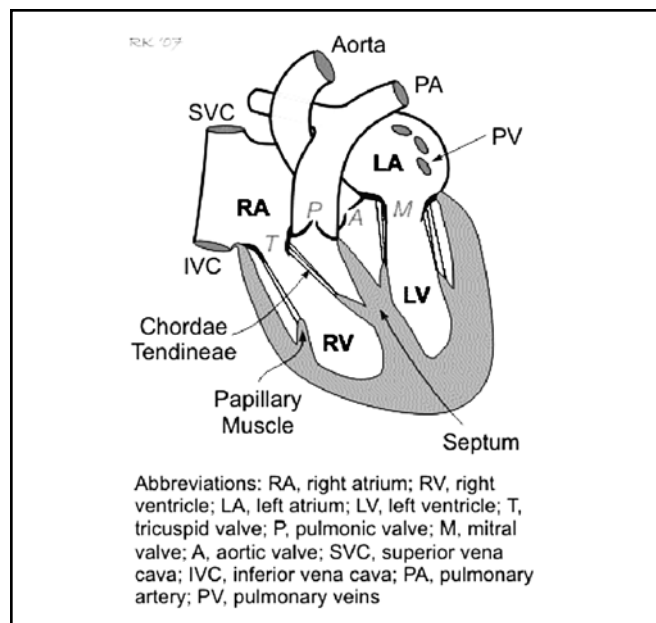


Figure 1: Anatomy of the Aortic and Mitral Valves
Klabunde, R.E. (2011). <http://cvphysiology.com/Heart%20Disease/HD001.htm>
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stenosis (AS) or mitral regurgitation (MR). A diastolic murmur is heard between S_2 and S_1 and accompanies aortic regurgitation (AR) or mitral stenosis (MS).

Diastolic murmurs are classified as early, mid, or late. Systolic murmurs are also classified as early, mid, late, or holosystolic (i.e., pansystolic). An early systolic murmur obliterates S_1 and extends to mid or late systole and sounds like “Shshsh Dub”. With a mid-systolic murmur both early and late systole are murmur free and it has a crescendo-decrescendo character and sounds like “Lub Shshsdub”. A late systolic murmur starts with the second half of systole and obliterates S_2 and sounds like “Lub Shshshs”. A holosystolic murmur obliterates S_1 and S_2 and sounds like “Shshshshshshshshs” (Alpert, 1990; Crawley, 1990; Klabunde, 2011; University of California San Diego, 2008; University of Washington, n.d.).

It is also important to note the location of where the murmur is loudest as well as whether and in which direction and areas it radiates.

Murmurs are rated for intensity using a six point grading system expressed as a fraction. Grade 1/6 is very faint; grade 2/6 is still quiet but heard immediately; grade 3/6 is moderately loud; grade 4/6 is loud with a palpable thrill; grade 5/6 is heard with the stethoscope partly off the chest wall; and grade 6/6 is so loud no stethoscope is needed (Choudhry & Etchells, 1999; University of California San Diego, 2008; University of Washington, n.d.).

Stenotic and Regurgitant Valvular Heart Disease

Pathophysiology of Aortic Regurgitation

In AR the AV cusps are still open during diastole. This causes hemodynamic volume overload on the left ventricle (LV) (see Figure 2). In diastole retrograde blood flows from the aorta (AO) into the LV and antegrade blood flows from the left atrium (LA) into the LV.

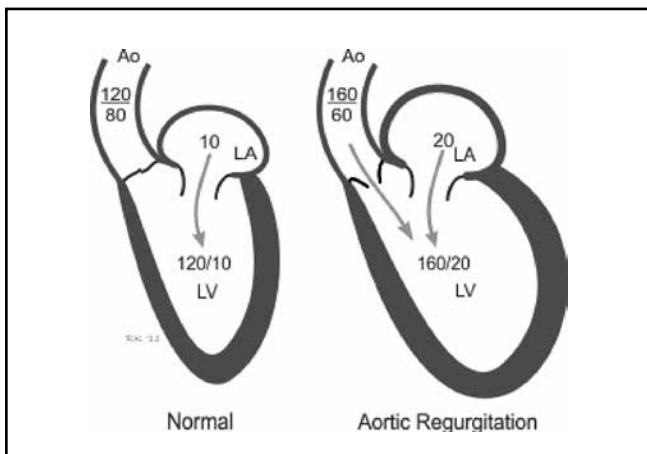


Figure 2: Pathophysiology of Aortic Regurgitation
Klabunde, R.E. (2011). <http://cvphysiology.com/Heart%20Disease/HD005.htm>
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AR can develop acutely as when the valve is destroyed by infective endocarditis (IE) or result from damage to the AO near the AV (e.g., acute aortic dissection/aneurysm or chest trauma). Acute AR is accompanied by pulmonary edema, shock and early death as the result of the sudden volume overload on a normal LV. Both left ventricular end-diastolic pressure (LVEDP) and left atrial pressure (LAP) increase rapidly and dramatically with a corresponding decrease in forward stroke volume (SV) and cardiac output (CO). Acute AR can be misdiagnosed as a non-valvular problem as the classical heart sounds of AR may be missing. These patients require vigilant monitoring as immediate cardiac surgery may be warranted (Bonow et al., 2006; Choudhry & Etchells, 1999; Crawley, 1990; Hamirani et al., 2012; Klabunde, 2011; Novaro, 2010; Vahanian et al., 2007).

AR can also develop gradually and be chronic, which creates a combined volume and pressure overload problem for the LV. The LV remodels to become more spherical in shape and compliant to regurgitant volume giving SV a chance to increase to maintain an effective CO. These patients can be asymptomatic for many years. In time, the heart will decompensate and pulmonary hypertension and right-sided heart failure will occur. Chronic AR arises from rheumatic heart disease (RHD), annular stretch from left ventricular dilatation, diseases that affect the connective tissue of the AO (e.g., Marfan's syndrome), degenerative deterioration with age, iatrogenic (e.g., catheter perforation of the AV), congenital heart defect, or inflammatory processes (e.g., vasculitis, aortitis, arteritis, reactive arthritis) (Bonow et al., 2006; Choudhry & Etchells, 1999; Crawley, 1990; Hamirani et al., 2012; Klabunde, 2011; Novaro, 2010; Reimer-Kent, 2007; Vahanian et al., 2007).

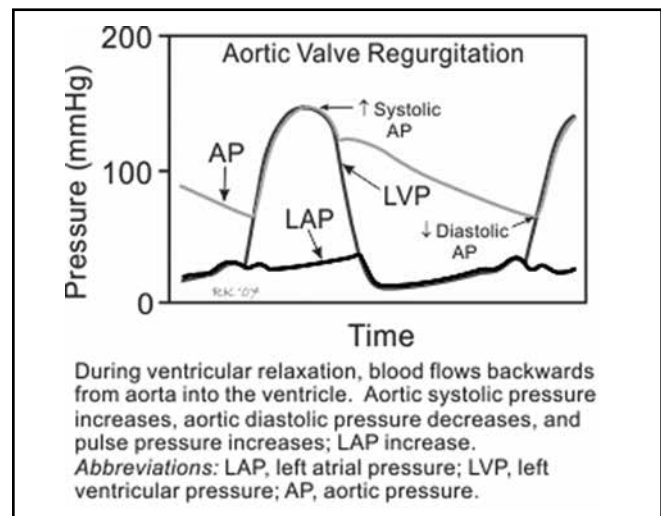


Figure 3: Aortic Regurgitation in Relation to the Cardiac Cycle
Klabunde, R.E. (2011). <http://cvphysiology.com/Heart%20Disease/HD005.htm>
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With AR there is no true isovolumetric relaxation or isovolumetric contraction (see Figure 3). The LV does not get a chance to relax because as soon as diastole begins, even before the MV opens, blood from the AO begins to fall back into the LV. Once the MV does open the LV must accommodate the continual retrograde blood flow from the AO as well as the antegrade blood flow from the LA. This double source of blood flow will significantly increase left ventricular end-diastolic volume (LVEDV) (i.e., preload). The Frank-Starling mechanism will be activated and initially SV will increase. The pulse pressure will also widen (e.g., greater than 50 mm Hg) with a higher than normal systolic pressure, from the force with which the large volume of blood is ejected forward during systole and a lower than normal diastolic pressure, from the rapid fall in aortic pressure as blood flows backward into the LV during diastole (Bonow et al., 2006; Choudhry & Etchells, 1999; Crawley, 1990; Hamirani et al., 2012; Klabunde, 2011; Novaro, 2010; Vahanian et al., 2007).

Heart Sounds Associated with Aortic Regurgitation

Several heart sounds are associated with AR. The retrograde blood flow through an incompetent AV into the LV causes a high-pitched, quiet, blowing, puffing, decrescendo, early diastolic murmur, which sounds like “Lub Pewwwwww” (see Figure 4). The murmur is early as this correlates with high aortic pressure and decrescendo as this correlates with the fall in aortic pressure that happens with retrograde blood flow into the LV. A high-pitched AR murmur is best heard by placing the diaphragm of the stethoscope firmly on the chest wall. Listen along the left sternal border at the third or fourth intercostal space with the patient sitting upward, leaning forward and at the end of expiration. Manoeuvres such as isometric exercise will increase systemic vascular resistance and accentuate the AR murmur. There is a positive relationship between the duration of the diastolic murmur and the severity of AR (Bonow et al., 2006; Choudhry & Etchells, 1999; Crawley, 1990; Hamirani et al., 2012; Klabunde, 2011; Novaro, 2010).

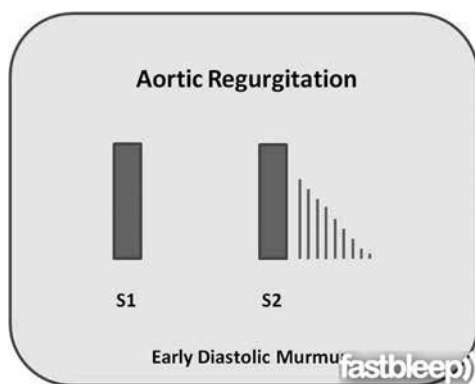


Figure 4: Aortic Regurgitation Murmur

<http://www.fastbleep.com/medical-notes/heart-lungs-blood/1/23/151>

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Due to the large SV travelling across the AV a short systolic aortic flow murmur that sounds like “Lub shshs Pewww” may be heard.

There may also be an apical low-pitched, soft, rumbling Austin Flint murmur late in diastole or presystole. Best heard at the apex with the patient left-side lying, this murmur is thought to be related to functional mitral stenosis (MS) where the normal anterior MV leaflet is compressed by regurgitant blood flow causing an obstruction to antegrade blood flow from the LA to the LV during diastole (Bonow et al., 2006; Choudhry & Etchells, 1999; Crawley, 1990; Hamirani et al., 2012; Klabunde, 2011; Novaro, 2010; University of California San Diego, 2008; University of Washington, n.d.).

Pathophysiology of Mitral Regurgitation

In MR the MV leaflets are still open during systole. This causes hemodynamic volume and pressure overload on the LA and LV (see Figure 5). During systole the LA receives retrograde blood flow from the LV, as well as antegrade blood flow from the pulmonary veins.

MR can develop acutely as when the valve is destroyed by IE, with myocardial ischemia that affects the wall of the LV and parts of the MV apparatus (e.g., papillary muscle/chordea tendinea rupture/dysfunction), or trauma (Bonow et al., 2006; Crawley, 1990; Curtin & Griffin, 2010; Klabunde, 2011; Turi, 2004; Vahanian et al., 2007).

Acute MR causes a sudden volume overload on both the LA and LV as it provides a low impedance pathway for retrograde blood to flow into the low pressure LA during LV systole. This will increase LV preload but forward SV and CO will be decreased. To compensate the LV will dilate and become hyperdynamic. Patients with acute MR develop pulmonary edema from the quick onset of high LAP and pulmonary venous pressure and this condition necessitates urgent cardiac surgery.

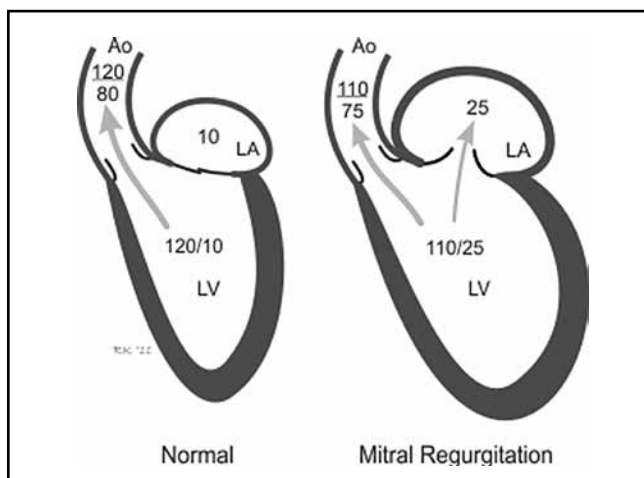


Figure 5: Pathophysiology of Mitral Regurgitation

Klabunde, R.E. (2011). <http://cvphysiology.com/Heart%20Disease/HD005.htm>

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MR can also develop gradually and be chronic from conditions such as RHD, annular stretch (e.g., left ventricular dilatation/cardiomyopathy from conditions such as untreated hypertension, alcohol abuse, or certain drugs), coronary artery disease, or myxomatous degeneration (common cause for MV prolapse). The etiology of myxomatous degeneration is unknown but thought to result from connective tissue matrix degeneration and loss of collagen fibres in the MV leaflets. Patients with chronic MR can be asymptomatic for many years as the LA and LV compensate and remodel their size and become compliant (Bonow et al., 2006; Crawley, 1990; Curtin & Griffin, 2010; Klabunde, 2011; Reimer-Kent, 2007; Turi, 2004; Vahanian et al., 2007).

The effects of MR on the cardiac cycle are depicted in Figure 6. Due to the large volume overload (retrograde LV blood flow and antegrade pulmonary venous blood flow) there is a large increase in LAP throughout the cardiac cycle. The high LAP produces a tall “v” wave (e.g., 70 to 80 mmHg) at the end of LV systole. With MR there is no true isovolumetric contraction or isovolumetric relaxation because as soon as LV systolic contraction begins, even before the AV opens, blood from the LV begins to fall back into the LA. Once the AV does open retrograde blood flow continues into the LA and antegrade blood starts to flow into the LV. This will increase LAP and also increase LVEDP and LVEDV (i.e., preload).

The Frank-Starling mechanism will be activated and initially SV will increase; however, the net amount of blood ejected into the AO will decrease because some of this volume is also flowing retrograde into the LA. Eventually the LV will dilate, afterload will increase and cardiac decompensation with right and left heart failure will ensue. Increased LA size increases the likelihood of developing atrial fibrillation and the potential for thromboembolic events (Bonow et al., 2006; Crawley, 1990; Curtin & Griffin, 2010; Klabunde, 2011; Turi, 2004; Vahanian et al., 2007).

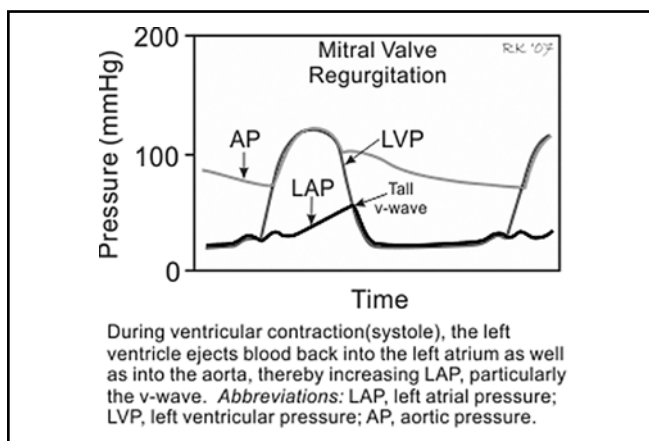


Figure 6: Mitral Regurgitation in Relation to the Cardiac Cycle

Klabunde, R.E. (2011). <http://cvphysiology.com/Heart%20Disease/HD005.htm>

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Heart Sounds Associated with Mitral Regurgitation

There are a variety of heart sounds with MR. The retrograde blood flow through an incompetent MV into the LA during systole causes a blowing holosystolic murmur that sounds like “Shshshshshshshshs” obliterating S_1 and S_2 (see Figure 7). The murmur is heard best at the cardiac apex (5th or 6th left intercostal space) with radiation towards the left anterior axillary line and left axilla. Listen with the diaphragm of the stethoscope with the patient supine and hear how the murmur intensifies when the patient moves into the left side lying position.

Due to the volume of retrograde blood flowing across the MV there may be a rumbling, early diastolic flow murmur. A third heart sound (S_3) (left atrial blood entering an already full LV in early diastole) or fourth heart sound (S_4) (left atrial blood entering a stiff, non-compliant LV during atrial systole during late diastole) may also be heard (Alpert, 1990; Bonow et al., 2006; Crawley, 1990; Curtin & Griffin, 2010; University of California San Diego, 2008; University of Washington, n.d.).

Pathophysiology of Mitral Stenosis

In MS the MV creates an obstruction that prevents blood flow from the LA into the LV during diastole. This causes hemodynamic pressure overload on the LA and pulmonary venous system (see Figure 8). The obstruction is most commonly caused by RHD with a latency period of approximately two decades before the onset of symptoms. RHD causes the MV orifice to become smaller and funnel-shaped as the MV thickens and calcifies, the leaflets scar and fuse at the commissures, and the chordae tendineae contract. Other less common causes include MV annular calcification, IE, systemic lupus erythematosus, rheumatoid arthritis, and intra-cardiac tumors [i.e., carcinoid or benign (e.g., atrial myxomas)] (Bonow et al., 2006; Crawley, 1990; Curtin & Griffin, 2010; Klabunde, 2011; Reimer-Kent, 2007; Turi, 2004; Vahanian et al., 2007).

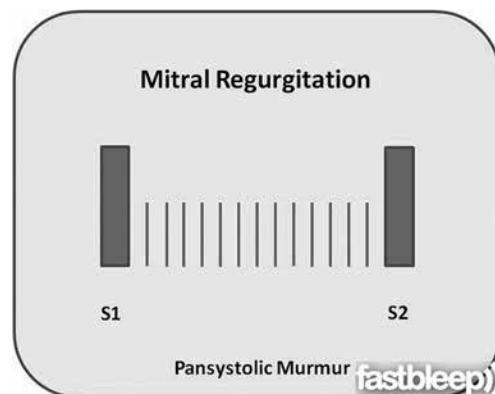


Figure 7: Mitral Regurgitation Murmur

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Normally at the end of diastole LAP equals left ventricular pressure. With the high resistance across the MV, pressure in the LA is higher than the pressure in the LV creating a diastolic pressure gradient across the MV (see Figure 9).

LAP, which is normally between 8 and 10 mmHg, is significantly elevated with MS (e.g., 25 to 30 mmHg) leading to LA enlargement. This in-turn will predispose the patient to atrial fibrillation and potential for systemic thromboemboli. Patients are often intolerant of atrial fibrillation as CO decreases from the loss of atrial contraction (kick) and a further decrease in diastolic filling of the LV.

High LAP is reflected back on the pulmonary venous system and right ventricle (RV). The RV hypertrophies because it is forced to generate pressures high enough to drive blood across an obstructed MV in an attempt to fill the LV and maintain CO. In time, pulmonary congestion/edema,

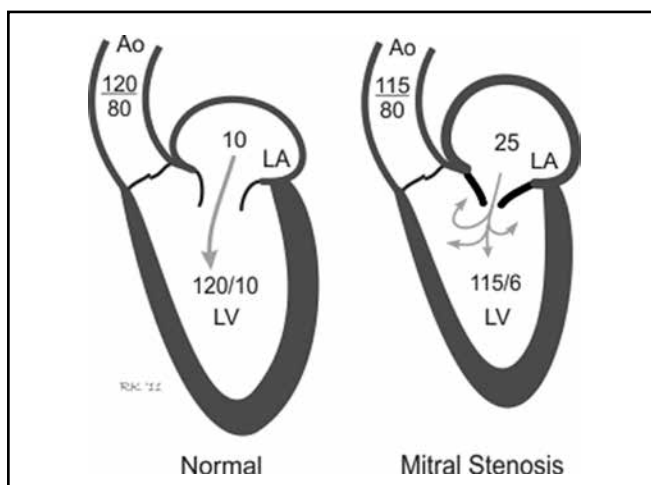


Figure 8: Pathophysiology of Mitral Stenosis

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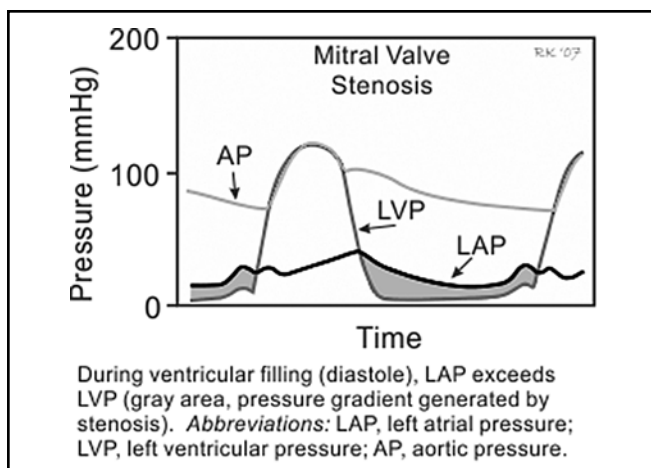


Figure 9: Mitral Stenosis in Relation to the Cardiac Cycle

Klabunde, R.E. (2011). <http://cvphysiology.com/Heart%20Disease/HD004.htm>

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pulmonary hypertension, and right-sided heart failure will develop. The valve orifice is halved in size (e.g., less than 2.5 cm²) before symptoms develop.

In MS the LV is not subjected to undue pressure and remains small and thin-walled. Impaired filling of the LV will decrease preload. In an attempt to compensate for this reduced SV the Frank-Starling mechanism will be activated. However, as the disease progresses, the heart will decompensate and CO and aortic pressure will decrease (Bonow et al., 2006; Curtin & Griffin, 2010; Crawley, 1990; Klabunde, 2011; Turi, 2004; Vahanian et al., 2007).

Heart Sounds Associated with Mitral Stenosis

The obstruction to diastolic blood flow from the LA to the LV in MS creates a unique array of heart sounds: an opening snap, a loud S₁, a low-pitched, mid-diastolic, rumbling murmur that sounds like whispering the letter "r" out loud, and a loud pulmonic component (P₂) of S₂ (see Figure 10). These sounds are best heard at the apex with the bell of the stethoscope and the patient in the left side-lying position.

The opening snap is caused by the flow of blood across the obstructed MV leaflets, which is followed by a loud S₁ from the stiff MV leaflets closing, which is followed by a mid-diastolic murmur. The duration of the murmur is proportional to the severity of the MS and with critical MS the diastolic murmur becomes diminished. With pulmonary hypertension an accentuated P₂ would follow the murmur (Bonow et al., 2006; Choudhry & Etchells, 1999; Crawley, 1990; Curtin & Griffin, 2010; Klabunde, 2011; University of California San Diego, 2008; University of Washington, n.d.).

Pathophysiology of Aortic Stenosis

In AS the AV creates an obstruction that prevents blood flow from the LV into the AO during systole. This causes hemodynamic pressure overload on the LV (see Figure 11). The obstruction develops when the AV calcifies (i.e.,

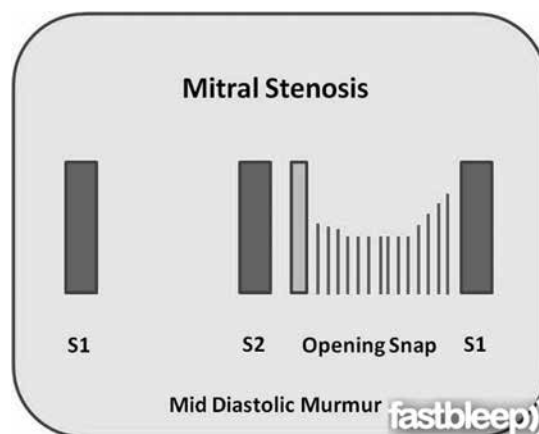


Figure 10: Mitral Stenosis Murmur

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degenerative or senile AS) or is congenitally deformed with only two cusps (i.e., bicuspid). Less common causes include RHD, radiation effects on the heart, and congenital aortic stenosis. The latter occurs when the AV commissures fail to fully develop in utero and the child is born with a unicuspid or bicuspid AV. The fusion of stiff, fibrotic cusps and commissures cause the AV orifice to take on a fish mouth-like appearance during systole (Bonow et al., 2006; Carabello, 2002; Cary & Pearce, 2013; Novaro, 2010; Vahanian et al., 2007).

Normally during systole, the pressure in the LV and AO are equal. With the high resistance across the AV, pressure in the LV is significantly higher than pressure in the AO creating a systolic pressure gradient across the AV (e.g., 50 mmHg or higher) (see Figure 12). Corresponding concentric hypertrophy of the LV develops to compensate for this pressure in order to maintain forward blood flow and CO. High peak left ventricular systolic pressure leads to an increase in afterload, a decrease in SV, and a resulting increase in left ventricular end-systolic volume (LVESV). This residual LVESV will be augmented by venous volume received during diastole, which will increase LVEDV (i.e., preload). The Frank-Starling mechanism is activated in an attempt to increase the driving force across the stenotic AV. As the LV becomes less compliant there is less capacity for LV diastolic filling and higher left ventricular diastolic pressure. This vicious cycle further impedes antegrade blood flow from the LA into the LV (Bonow et al., 2006; Carabello, 2002; Cary & Pearce, 2013; Novaro, 2010; Vahanian et al., 2007).

To protect the pulmonary venous system from the high systolic pressures of AS and to maintain forward SV requires an adequately functioning MV. Functional MR may develop as LAP is easier for the LV to overcome than AO pressure. This further compromises the delicate balance that comes with the low, fixed CO associated with AS. Efforts at manipulating any components of CO (i.e., heart rate or SV [preload,

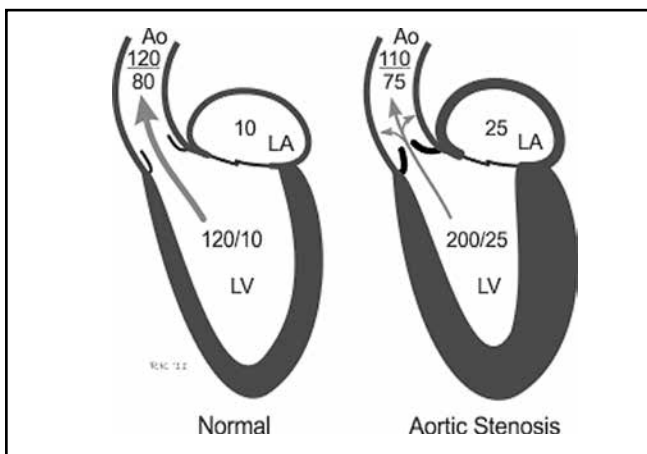


Figure 11: Pathophysiology of Aortic Stenosis

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contractility, and afterload]) with medical management once AS is severe are of little help and may possibly be detrimental.

When the disease is advanced, the classical triad of severe AS symptoms appear (i.e., chest pain, syncope, dyspnea). The angina-like chest pain is not necessarily related to coronary artery disease, but rather to an imbalance in the oxygen supply/demand for an extremely hypertrophied LV and the poor delivery of blood to the endocardium. Syncope is caused by decreased cerebral blood flow and dyspnea comes from left ventricular failure. Severe AS is life-limiting and with the onset of symptoms life expectancy is less than two to three years (Bonow et al., 2006; Carabello, 2002; Cary & Pearce, 2013; Novaro, 2010; Vahanian et al., 2007).

Heart Sounds Associated with Aortic Stenosis

The obstruction to systolic blood flow from the LV to the AO in AS creates an array of heart sounds including a systolic ejection click, systolic murmur, paradoxical splitting of S_2 , and possibly an S_4 .

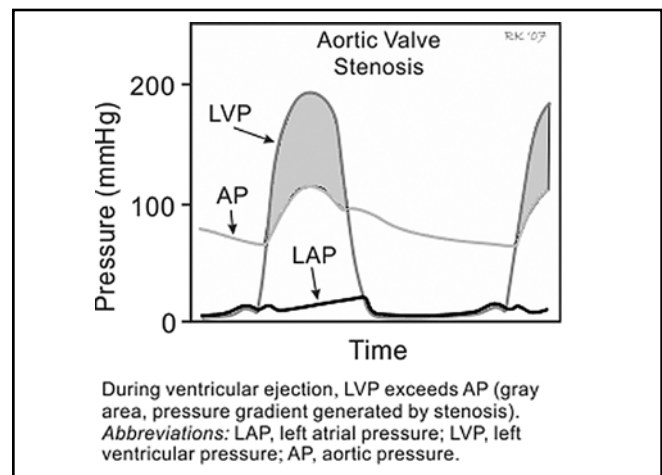


Figure 12: Aortic Stenosis in Relation to the Cardiac Cycle

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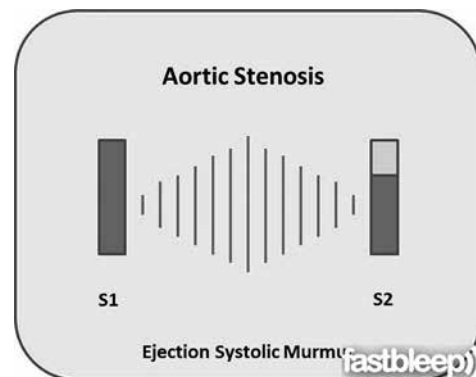


Figure 13: Aortic Stenosis Murmur

<http://www.fastbleep.com/medical-notes/heart-lungs-blood/1/23/151>

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The ejection click follows a normal S_1 and is due to the sound generated when the cusps of a stiff, non-compliant, yet mobile AV open. The crescendo-decrescendo (i.e., diamond) shaped systolic murmur is low to medium-pitched and harsh, rasping, grunting, rough, whooshing, or humming in quality. This murmur is best heard at the base of the heart in the AV area (second intercostal space right sternal border) and it radiates to the carotid arteries.

The closing of a poorly mobile AV will affect the aortic component (A_2) of S_2 . If A_2 is delayed because it was forced to close after P_2 , a paradoxical split of S_2 will be heard. An S_4 may also be heard during atrial contraction (kick) when more LA blood enters an already full, stiff and noncompliant LV in late diastole (Alpert, 1990; Bonow et al., 2006; Carabello, 2002; Cary & Pearce, 2013; Novaro, 2010; University of California San Diego, 2008; University of Washington, n.d.).

Conclusion

This concludes Part 2 with an overview of anatomy and pathophysiology of valvular heart disease and a description of the heart sounds associated with stenotic and regurgitant AV and MV disease. Heart sounds are just one part of your assessment, which must be correlated with the patient's clinical condition.

Remember it takes much practice to become proficient at this important nursing skill, so listen and learn by visiting the numerous websites that offer recordings of the sounds covered in this article like <http://medicine.osu.edu/exam/>, <http://www.med.ucla.edu/wilkes/intro.html>, <http://depts.washington.edu/physdx/heart/demo.html>, or <http://www.cardiosource.com/heartsounds/index.asp>. ♥

About the Author

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Clinical Improvement Grant Program

The purpose of this grant is to provide CCCN members with financial support for knowledge dissemination and knowledge utilization projects pertaining to cardiovascular or cerebrovascular nursing in Canada.

This grant is directed to nurses in clinical settings who use results from research to improve their practice, and to research nurses wishing to establish linkages with clinical nurses to facilitate the uptake of research evidence and advance clinical practice.

Types of clinical projects to be funded

1. Knowledge Dissemination Project (e.g., research/education day, speaker series)
2. Knowledge Utilization Project (e.g., policy development, planning meeting, specialty certification preparation course)

Range of funding

1. \$1,000 to a maximum of \$5,000
2. A candidate may only receive one CCCN clinical grant for the same project

Eligibility

1. Canadian citizens or permanent residents
2. Current members of the CCCN
3. Currently licensed as a nurse in a provincial/territorial professional association
4. The project must include both clinical and research nurses

Selection criteria

The CCCN National Research Committee reviews grant applications with attention to the relevance of the project. In the event that projects receive equal rating, then preference will be given to the applicant who 1) has not received a funding from CCCN in the past five years, or 2) has contributed the most to CCCN endeavours.

Closing date for applications

August 31, 2013

For complete details, please visit our website at www.ccn.ca

Programme de bourse pour l'avancement de la pratique clinique

Le Programme de bourse pour l'avancement de la pratique clinique vise à offrir du soutien financier aux membres du Conseil canadien des infirmières et infirmiers en soins cardiovasculaires (CCIISC) afin de réaliser des projets de diffusion et d'utilisation des connaissances issues de la recherche en soins cardiovasculaires ou cérébrovasculaires au Canada.

La bourse est destinée à la fois aux infirmières œuvrant en milieux cliniques qui utilisent les résultats de la recherche pour améliorer leur pratique, et aux infirmières de recherche qui veulent établir des liens avec les infirmières œuvrant en milieux cliniques pour faciliter l'utilisation des données issues de la recherche et faire avancer la pratique clinique.

Types de projets cliniques visés

1. Projets de diffusion des connaissances
2. Projets d'utilisation des connaissances

Éventail des possibilités de financement

1. Entre 1 000 \$ et 5 000 \$ au maximum
2. Une candidate peut recevoir une seule bourse du CCIISC pour le même projet d'avancement de la pratique clinique.

Critères d'admissibilité

1. Détenir la citoyenneté canadienne ou le statut de résident permanent
2. Être membre actuelle du CCIISC
3. Être infirmière autorisée actuellement par une association professionnelle provinciale ou territoriale
4. Le projet doit inclure à la fois la participation d'infirmières œuvrant en milieux cliniques et d'infirmières de recherche.

Critères de sélection

Le Comité national de la recherche du CCIISC examine les demandes de bourse en fonction de la pertinence du projet par rapport au secteur visé. Si plusieurs projets obtiennent une cote scientifique égale, la préférence sera accordée à la candidate 1) n'ayant pas reçu de soutien financier du CCIISC au cours des cinq années précédentes, ou 2) ayant contribué le plus aux entreprises du CCIISC.

Date de clôture pour la présentation des demandes

31 août de chaque année

Pour plus de détails, veuillez visiter notre site Web à www.ccn.ca

Research Grant Program

The purpose of this grant is to provide funds to CCCN members for research pertaining to cardiovascular or cerebrovascular nursing in Canada. A maximum of \$5,000 is available for this competition.

Types of research to be funded

1. Development of a research proposal that will lead to funding from another granting agency
2. Pilot study, a small project, or instrument development and testing
3. Evaluation of a nursing intervention.

Range of funding

1. \$1,000 to a maximum of \$5,000
2. A candidate may only receive one CCCN research grant for the same project.

Eligibility

1. Canadian citizens or permanent residents
2. Current members of the CCCN
3. Currently licensed as a nurse in a provincial/territorial professional association.

Selection criteria

The CCCN National Research Committee reviews grant applications with attention to both relevance and scientific merit. In the event that projects receive equal scientific rating, then preference will be given to the applicant who 1) has not received a funding from CCCN in the past five years, or 2) has contributed the most to CCCN endeavours.

Closing date for applications

August 31, 2013

For complete details, please visit our website at www.cccn.ca

Programme de bourse de recherche

Le Programme de bourse de recherche vise à offrir du soutien financier aux membres du Conseil canadien des infirmières et infirmiers en soins cardiovasculaires (CCIISC) afin de réaliser de la recherche sur les soins cardiovasculaires ou cérébrovasculaires au Canada. Une somme maximale de 5 000 \$ est disponible dans le cadre du concours.

Types de recherche visés

1. Développement d'une proposition de recherche pouvant attirer du soutien financier d'un autre organisme subventionnaire
2. Étude pilote, petit projet ou développement et mise à l'essai d'un instrument
3. Évaluation d'une intervention infirmière.

Éventail des possibilités de financement

1. Entre 1 000 \$ et 5 000 \$ au maximum
2. Une candidate* peut recevoir une seule bourse de recherche du CCIISC pour le même projet.

Admissibilité

1. Détenir la citoyenneté canadienne ou le statut de résident permanent
2. Être membre actuelle du CCIISC
3. Être infirmière autorisée actuellement par une association professionnelle provinciale ou territoriale.

Critères de sélection

Le Comité national de la recherche du CCIISC examine les demandes de bourse en tenant compte à la fois de la pertinence et du mérite scientifique du projet. Si plusieurs projets obtiennent une cote scientifique égale, la préférence sera accordée à la candidate 1) n'ayant pas reçu de soutien financier du CCIISC au cours des cinq années précédentes, ou 2) ayant contribué le plus aux entreprises du CCIISC.

Date de clôture pour la présentation des demandes

31 août de chaque année

Pour plus détails, veuillez visiter notre site Web à www.cccn.ca

CCCN 40th Anniversary—40 Weeks to Celebrate!

We invite you, our CCCN members, to visit our website at www.cccn.ca and participate in our "40 Weeks to Celebrate" Contest, which began March 25, 2013. Each week, members can click on the "Weekly Word" and enter to win a \$5.00 Tim Hortons gift card. Each member who enters before **Week 20** will have their name entered for a chance to win one "Vascular 2013 Conference Registration" in Montreal. Each member who enters by **Week 40** will have a chance to win one of five "2014 CCCN



Canadian Council of
Cardiovascular Nurses

*1973–2013: Celebrating 40 years as the
voice for cardiovascular nursing in Canada*

memberships". Winners' names will be posted on the website every Friday. (Maximum one entry per member, per week).

Updating Your Cardiovascular Toolkit

3rd Annual Spring Conference

St. John's, NL, May 2013

The Canadian Council of Cardiovascular Nurses (CCCN) held its third National Spring Conference "Updating your Cardiovascular Toolkit" in St. John's, NL, in conjunction with the local CCCN Division. The one-day event took place at the Sheraton Hotel with more than 80 registered delegates in attendance. The event began with the Newfoundland Division's Annual General meeting on Friday night followed by a talk by Dr. Kevin Melvin, cardiac surgeon, who gave an enlightening presentation on the history of cardiac surgery in Newfoundland. There were about 25 people in attendance. The local CCCN Division was fortunate to have the National Board of Directors attend their AGM.

The one-day conference was well received by those in attendance. The opening plenary speaker, Dr. Bruce Van Vliet, gave a presentation titled, "Stemming the Salt Tide: Assessment and Interventions to Reduce Sodium Intake in Hypertensive Patients". It is known that many Canadians eat well above the recommended daily amounts of sodium and Dr. Van Vliet spoke on the positive benefits of sodium reduction on hypertension and cardiovascular disease. He identified the need for moderation of sodium use and the importance of patient education, motivation and resources to attain sodium reduction.

The remainder of the day provided sessions on a variety of topics from chronic total occlusion to the initiation of a TAVI program for Newfoundland and the importance of palliation in the cardiac population. (See website for detailed program). The conference evaluations were very positive. Respondents highlighted how they liked the clinical approach to the conference and the varied health care professionals who spoke during the day.

We were very fortunate to have a personal story to close out the day. The NL Heart and Stroke Foundation provided an overview of the Automated External Defibrillator (AED) program in Newfoundland. As part of the presentation, we heard from Mr. Hedges, a patient who was successfully resuscitated with an AED at a hockey arena while playing hockey. He highlighted how important the AED program was for him and his family and he is living proof that the device does save lives.

The Canadian Council of Cardiovascular Nurses is committed to providing ongoing education to its members. We currently run two National Conferences with one in the fall and the second in the spring.

The Updating your Cardiovascular Toolkit Spring Conference 2014 will take place in Calgary, Alberta.

Rodolfo Pike, RN, MN, NP
Director of Professional Development, CCCN

CCCN would like to thank the following sponsors of the event:



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CCCN Recognition Awards

Do you know a nurse who deserves recognition for her/his accomplishments in and contribution to the field of Cardiovascular Nursing? A nurse who demonstrates excellence in her/his practice?

CCCN is inviting applications for the CCCN Recognition Awards. Awards will be presented at the CCCN Annual General Meeting & Scientific Sessions, October 18, 2013, in Montreal, QC. Deadline for application is August 31, 2013. For nomination guidelines and additional information visit our website at www.cccn.ca.

Please consider nominating a nurse you feel exemplifies the best in cardiovascular nursing.

Notice: CCCN Annual General Meeting

Date: Friday, October 18, 2013

Time: 17:30–19:30

Location: Palais des congrès de Montréal

Avis : Assemblée générale annuelle du CCIISC

Date : Le vendredi 18 octobre 2013

Heure : 17 h 30–19 h 30

Lieu : Palais des congrès de Montréal

Programme de reconnaissance du mérite en soins infirmiers cardiovasculaires du CCIISC

Pour obtenir plus d'information sur les critères et pour obtenir le formulaire de mise en candidature, veuillez consulter la section sur les prix de reconnaissance du mérite de notre site internet à www.cccn.ca. Date limite pour soumettre une candidature : 31 août 2013.

Cérémonie de remises des prix : le 18 octobre 2013, à Montréal, dans le cadre de l'Assemblée générale annuelle du CCIISC.

New Director of Research

The CCCN Board of Directors is pleased to announce that Dr. Lisa Keeping-Burke has accepted the position of Director of Research for the Canadian Council of Cardiovascular Nursing. Lisa is a tenured professor of nursing at the University of New Brunswick in Saint John and has a long history with the New Brunswick Heart Centre. Lisa has been the CCCN Division Research chair for New Brunswick for the past two years.

CCCN Dates to Remember

Session

National Learning Sessions Webinar

Recognition & Awards

Clinical Improvement & Research Grants

Vascular 2013 – Canadian Cardiovascular Congress & CCCN Annual General Meeting and Scientific Sessions, Montreal, QC

Session Date / Submission Deadline

4th Thursday of every month

August 31, 2013

August 31, 2013

October 17–20, 2013

Call for Resolutions for the 2013 CCCN Annual General Meeting

Resolutions are invited for discussion at the 2013 annual general meeting of CCCN. Members wishing to propose a resolution must have it typed and signed by at least two other members. If the president and the secretary agree that the resolution is appropriate, it shall be included with the names of the mover and seconders in the agenda for the meeting. At

the annual meeting, a member proposing a resolution or the proposer's appointed representative will be asked to clarify the background to the resolution, if necessary, and to formally move acceptance of the same.

Please submit resolutions to info@cccn.ca by **September 27, 2013**.

Format for submitting resolutions

The resolution has two parts; first the "preamble" and then the "resolved". Please provide the name and address of each of the individuals participating in the submission of the resolution. The following example is provided for your guidance

Preamble— "WHEREAS" *smoking is a known risk factor related to the development and progression of cardiovascular disease;*

BE IT RESOLVED—*that no smoking be permitted in any business meeting or scientific symposia hosted by the Council.*

Submitted by:

Mover: Name: _____

Address: _____

Seconder: _____

Seconder: _____

Address: _____

Address: _____

Date: September 27, 2013

Appel de résolutions pour l'assemblée générale annuelle du CCIISC de 2013

Nous vous invitons à nous faire parvenir vos résolutions pour qu'elles puissent être discutées à l'occasion de l'assemblée générale annuelle du CCIIS de 2013. Les membres qui veulent présenter une résolution doivent la faire signer par au moins deux personnes. À l'assemblée générale annuelle, les membres proposant une résolution ou leur représentant(e) seront priés de donner le contexte de la résolution et, au besoin, de présenter une motion en à bonne et due

forme pour son acceptation. La présidente et la secrétaire se réservent le droit de décider du bien-fondé des résolutions proposées, compte tenu des statuts du Conseil et de tout autre élément qui risque de compromettre la validité de la résolution.

Veuillez soumettre vos résolutions au info@cccn.ca avant le **27 septembre 2013**.

Format de présentation des résolutions

La résolution comporte deux parties, d'abord le "Préambule", puis la partie qui commence par "Il est résolu que". Veuillez fournir le nom et l'adresse de chaque personne participant à la soumission de la résolution. Voici un exemple dont vous pourrez vous inspirer :

Préambule—*Attendu que l'on sait que l'usage de la cigarette est un facteur de risque lié à l'apparition et à la progression des maladies cardio-vasculaires,*

IL EST RÉSOLU QUE—*L'usage de la cigarette sera interdit à l'occasion des réunions d'affaires et des colloques scientifiques du Conseil.*

Soumis par :

Motionnaire : Nom : _____

Adresse : _____

Co-motionnaire : _____

Co-motionnaire : _____

Adresse : _____

Adresse : _____

Date : le 27 septembre, 2013

Caring for Patients Receiving Therapeutic Hypothermia Post Cardiac Arrest in the Intensive Care Unit

Glen Gardner, RN, MN, and Sandra MacDonald, RN, PhD

Abstract

Survivors of ventricular fibrillation cardiac arrest have poor and often devastating neurological outcomes despite advances in resuscitation techniques and services (Bernard et al., 2002; Collins & Samworth, 2008). In an effort to increase survival rates, improve neurological outcomes and reduce mortality for surviving patients, clinical trials have shown that a mild state of therapeutic hypothermia (32°C to 34°C) has been linked to improved patient outcomes post cardiac arrest (Koran, 2008; Lee & Asare, 2010). Many hospitals in Canada currently use therapeutic hypothermia (TH), but the nursing care requires advanced nursing knowledge and skills.

In an effort to prepare registered nurses to care for patients receiving TH, a specially designed education program was implemented at the Rouge Valley Health System Hospital (RVHS) in Ontario. Busy nurses need flexibility in the delivery of programs in the clinical setting, and this program was designed to meet that need with a combination of self-paced modules, lectures, discussions and a return demonstration. In this article, the authors discuss the nursing care of post cardiac arrest patients receiving TH, and the design and implementation of the education program.

Key words: therapeutic hypothermia, neuromuscular blocking agents, train of four monitoring

Gardner, G., & MacDonald, S. (2013). Caring for Patients Receiving Therapeutic Hypothermia Post Cardiac Arrest in the Intensive Care Unit. *Canadian Journal of Cardiovascular Nursing*, 23(3), 15–17.

Les soins aux patients places sous hypothermie thérapeutique après un arrêt cardiaque dans une unité de soins intensifs

Les survivants d'un arrêt cardiaque suite à une fibrillation ventriculaire présentent des séquelles neurologiques souvent dévastatrices malgré les avancées en matière de techniques de réanimation (Bernard, et al., 2002; Collins & Samworth, 2008). Afin d'améliorer les taux de survie et de réduire les séquelles neurologiques ainsi que la mortalité chez les patients qui survivent à un arrêt cardiaque, les études cliniques ont démontré qu'un léger état d'hypothermie thérapeutique (HT) après l'arrêt cardiaque (32°C et 34°C) avait été associé à de meilleurs résultats chez les patients (Koran, 2008; Lee & Asare, 2010). De nombreux

hôpitaux au Canada utilisent actuellement ce traitement d'HT. Or, son application nécessite le développement de connaissances et d'habiletés avancées chez les infirmières. Dans le but de préparer les infirmières à prendre en charge les patients placés sous HT, un programme de formation spécifique a été implanté au Rouge Valley Health System Hospital en Ontario. Les infirmières, sollicitées par leur travail, requièrent des programmes de formation flexibles et dispensés de manière à répondre à leurs besoins par une combinaison de modules d'auto-apprentissage, de lectures, de discussions et de démonstration. Dans cet article, les auteurs décrivent les soins infirmiers requis par les patients soumis à une HT après un arrêt cardiaque ainsi que la structure et l'implantation du programme de formation.

Background

Cardiac arrest results in global cerebral ischemia and can lead to massive neurological damage in those who survive (Bernard et al., 2002; Bernard, Jones, & Horne 1997; Collins & Samworth, 2008; Lee & Asare, 2010). In 2007, there were more than 45,000 cardiac arrests in Canada with less than 5% survival rate for those occurring outside of the hospital, and an 18% survival rate for those occurring in hospital (Geocadin, Koenig, Stevens, & Peberdy, 2007). In a prospective observational study on out-of-hospital cardiac arrests in North American sites, survival rates ranged from 3% to 16.3%, with a 5.5% survival rate for out-of-hospital cardiac arrests in Toronto, as compared to 9.7% in Vancouver, and 16.3% in Seattle, USA (Nichol et al., 2008). Although rates of survival for in-hospital arrests have improved to 22.3% in 2009 (Girotra, Nallamothu, Spertus, Krumholz & Chan, 2012), survival rates and neurological outcomes post cardiac arrest continue to be a concern.

In an effort to increase survival rates, improve neurological outcomes and reduce mortality for surviving patients, clinical trials have shown that a mild state of therapeutic hypothermia (32°C to 34°C) has been linked to improved patient outcomes (Collins & Samworth, 2008; Geocadin et al., 2007; Koran 2008; Lee & Asare, 2010; Nielsen et al., 2009). "Patients who present with non-perfusing ventricular tachycardia or ventricular fibrillation, are resuscitated to hemodynamic stability, and remain unresponsive should undergo therapeutic hypothermia" (CAEP, 2005, p.6). Therapeutic hypothermia (TH) is currently used in the intensive care setting in many hospitals, but it requires specialized nursing care, including the use of neuromuscular blocking agents (NMBA) and the train of four (ToF) testing for monitoring the complications from the NMBAs, which can include respiratory arrest.

Neurological Outcomes of Cardiac Arrest

It has long been recognized that survivors of cardiac arrest have poor and often devastating neurological outcomes

despite advances in resuscitation techniques and services (Bernard et al., 2002; Geocadin et al., 2007; The Hypothermia After Cardiac Arrest Study Group, 2002). During cardiac arrest, the brain suffers from a lack of blood flow, which results in global ischemia and a loss of glucose supply. The neurons experience hypoxia within 20 seconds and the central nervous system suffers injury within five minutes (Bernard et al., 2002). There is a loss of integrity at the cellular level, which leads to a cascade of events, resulting in neurological dysfunction and injury. Glutamate, a neurotransmitter, is released from the pre-synaptic cells causing toxic injury. An influx of calcium ions leads to the release of oxygen free radicals. Cellular respiration is halted and acidosis occurs. Even with the initiation of cardiopulmonary resuscitation, only 30% of the normal cerebral blood flow is restored (Bernard et al., 2002; Geocadin et al., 2007; Koran, 2008).

Injury to the brain can continue for hours or days once there has been a return of spontaneous circulation (ROSC). The oxygen free radicals continue to assault the cerebrum along with an increase in the inflammatory markers such as C reactive protein. The blood brain barrier integrity is compromised, which allows for further injury from the toxins that circulate once cerebral circulation has been re-established. The most vulnerable areas to injury during cardiac arrest and reperfusion are the cerebral cortex, cerebella purkinje cells and the hypothalamus. This damage often leads to a persistent comatose state as being the most likely outcome for cardiac arrest survivors (Bernard et al., 2002; Collins & Samworth, 2008; Geocadin et al., 2007). As a result of injury to the brain during a cardiac arrest, the traditional treatment for cardiac arrest patients has largely been supportive.

Therapeutic Hypothermia

The Canadian Association of Emergency Physicians (CAEP) (2005) and the American Heart Association have developed standards of practice for TH (Neumar et al., 2010). TH is the only in-hospital therapy that has been shown to have

improved patient neurological outcomes after cardiac arrest (Bernard et al., 1997; Collins & Samworth, 2008; Lee & Asare, 2010). The recommended inclusion and exclusion criteria for patients to receive TH can be found in Table 1.

During TH patients are cooled to a target core body temperature of 32°C to 34°C by external cooling devices such as a cooling blanket or ice packs. The target temperature is maintained for 24 hours, after which passive warming is initiated for eight hours. Passive warming is achieved by removing all external cooling devices and allowing the core body temperature to slowly increase on its own. Sedation and NMBAs, such as pancuronium, are administered to sedate the patient and to control the shivering that occurs from the hypothermia. Once the core body temperature returns to normal, the patient is monitored as per usual post cardiac arrest protocols.

Train of Four Monitoring

Caring for patients receiving TH involves monitoring for the complications of hypothermia and adjusting care in consultation with the team. One of the common complications, shivering, is managed through the use of NMBAs, which is monitored using a peripheral nerve stimulator monitor. The use of a peripheral nerve stimulator to monitor a patient receiving NMBAs is a common practice in critical care and operative areas (Jones 2003; Merchant et al., 2012; Murray et al., 2002). While there are various types of peripheral nerve stimulator testing available, the train of four (ToF) is most commonly recommended and used (Jones, 2003; Merchant et al., 2012). The ToF monitoring consists of applying four short electrical pulses of 2 Hertz (Hz) every 0.5 seconds along a nerve, usually the ulnar nerve. The ToF is thought to be less painful than other modes of nerve stimulation, such as the double burst stimulator, which uses two bursts of 50 Hz. Nursing care also includes closely monitoring clinical signs, such as spontaneous respirations, and increased peak airway pressures to determine the effectiveness of the NMBAs. Best practice includes ongoing neurological assessment (e.g., Glasgow Coma Scale), ToF testing, and monitoring clinical signs to titrate the effect of the NMBAs, as ordered.

The aim of careful monitoring is to prevent the excessive accumulation of NMBAs and active metabolites, which is associated with delayed recovery and prolonged ventilation and weakness (Jones 2003; Murray et al., 2002). A twitch response of one to two twitches after the application of four impulses is related to an 80% to 90% effective blockade, which is the optimal level for patients receiving NMBAs (Burton & Alexander, 2006). While sources differ on the frequency of peripheral nerve checks, most agree that increased frequency (every 15 to 30 minutes) while achieving the block is desired. Once the optimal level is achieved and no further titration is required, most sources agree that monitoring can take place every two to four hours until the core body temperature returns to normal and the chemical paralysis is discontinued in consultation with the team (Jones, 2003).

Table 1: Criteria for Patient Inclusion and Exclusion for Therapeutic Hypothermia	
Inclusion Criteria	Exclusion Criteria
Witnessed arrest	Tympanic temperature < 30°C
Ventricular fibrillation	Drug induced coma
Non perfusing ventricular tachycardia	Mean Arterial Pressure < 60mm Hg longer than 30 minutes after ROSC
18 to 75 years of age	Arterial oxygen saturation < 85% for >15 minutes after ROSC
Maximum downtime = 15 minutes No longer than 60 minutes of resuscitation efforts.	Terminal illness and known coagulopathy
(CAEP, 2005; Collins & Samworth, 2008; Geocadin et al., 2007; Koran, 2008; Neumar et al., 2010)	

Knowledge to Practice

Rouge Valley Health System Hospital (RVHS) cardiologists and internists, as well as staff nurses and the clinical practice leaders of the ICU/CCU identified the need to use TH for cardiac arrest survivors. However, prior to implementing this treatment, education of the critical care nurses was identified as a priority. Two clinical practice leaders developed a self-learning package (SLP) for nurses to provide the evidence needed to support the nursing care of patients receiving NMBAs and ToF monitoring (Blake & Tomarchio, 2010). G.G., one of the authors, then developed two accompanying education sessions on NMBAs and ToF. The critical care nurses completed the SLP, attended the two education sessions and participated in a return demonstration of the ToF. Best practice standards have been further supported at RVHS through the implementation of policies, order sets and documentation tools (cooling checklist, and ToF checklist) to sustain nurses' knowledge and ensure high-quality care.

There have been many success stories caring for patients receiving TH at RVHS, such as a previously healthy male patient who had suffered a ventricular fibrillation cardiac arrest at home due to an adverse reaction to a new medication. Once in the ICU the patient's temperature was maintained between 32° C and 34° C for 24 hours and NMBAs were used to facilitate cooling and control shivering. The patient was re-warmed after 24 hours and regained consciousness. Ten days after his arrest he had a normal neurological exam and a few days later he walked out of the ICU with his family.

Summary

Therapeutic hypothermia has been shown to be an effective treatment for post cardiac arrest patients, but it does require critical care nurses to have advanced knowledge and additional skill sets in order to implement the treatment safely. Completion of a flexible education program that included a self-learning package, lectures, discussion and a return demonstration helped to prepare the nurses to care for patients receiving therapeutic hypothermia. Busy nurses need flexibility in the delivery of education programs in the clinical setting and the education program at this institution supported a flexible approach to preparing nurses to care for patients receiving TH in the ICU. ♥

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The Transition from Acute Care to Home: A Review of Issues in Discharge Teaching and a Framework for Better Practice

Meghan McBride, RN, BScN, MA, and Gavin J. Andrews, BA, PhD

Abstract

Patients are often sent home with complex discharge plans that can become overwhelming and difficult to follow. By contrast, implementing effective teaching at the time of discharge can lead to a decrease in the rate of hospital readmissions and mortality for patients post discharge (Koelling, Johnson, Cody, & Aaronson, 2005). Unfortunately, many of the discharge teaching practices and programs used in health care settings have been criticized as being ineffective. Ensuring that patients are prepared for the transition from hospital to home after a cardiac event will require a fundamental shift in how teaching is performed in acute care settings. In this paper, the authors identify and examine models and concepts relevant to improving the process of providing discharge education in acute care

settings. This includes attention to adult education, self-management and patient-centred care. A practical framework was developed: Important Elements of Effective Discharge Teaching. This framework can be used by frontline staff to initiate realistic practice change and promote the use of evidence-based strategies related to discharge teaching in acute care settings. The Important Elements of Effective Discharge Teaching framework provides health care practitioners with a tool to evaluate and reflect on their current professional practice and provides examples of teaching strategies that are based on best evidence. Nurses can incorporate elements of this framework while providing health teaching to patients after a cardiac event.

Key words: adult education; discharge teaching; nursing practice; patient education; acute care; cardiovascular

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La transition entre les soins aigus et le retour au domicile : Revue des buts de l'enseignement au congé et cadre de référence pour une meilleure pratique

Suite à une hospitalisation, les patients sont souvent retournés à leur domicile avec des plans thérapeutiques complexes qui peuvent devenir un fardeau et sont difficiles à suivre. En revanche, la mise en œuvre efficace de l'enseignement au moment du congé peut se traduire par une diminution du taux de réhospitalisations et de mortalité (Koelling, Johnson, Cody, et Aaronson, 2005). Malheureusement, les modes d'enseignement au congé et des programmes appliqués dans les établissements de santé ont été, pour la plupart, considérés comme étant inefficaces. Un changement fondamental dans la façon dont l'enseignement est dispensé dans les établissements de soins de courte durée doit être fait afin que les patients soient préparés pour la phase de transition entre l'hôpital et le domicile après

un événement cardiaque. Dans cet article, les auteurs identifient et analysent les concepts pertinents pour améliorer le processus d'enseignement au patient lors d'un congé. Ont été inclus dans cette analyse, l'étude des principes de l'éducation aux adultes, de l'auto-gestion ainsi que des soins centrés sur le patient. Cela a permis de développer un cadre de référence pratique pour un enseignement efficace lors du congé. Ce cadre peut être utilisé par le personnel de première ligne pour amorcer un changement de pratiques réaliste et promouvoir l'utilisation des stratégies fondées sur les résultats probants, concernant l'enseignement au patient dans les établissements de soins aigus. Ce cadre de référence fournit aux professionnels de la santé un outil pour évaluer et réfléchir sur leur pratique professionnelle actuelle, et présente des exemples de stratégies éducatives fondées sur les résultats probants. Les infirmières peuvent utiliser les éléments de ce cadre pour prodiguer aux patients l'enseignement lors du congé suite à un événement cardiaque.

Providing patient care that is based on the best available clinical evidence is an explicit standard of practice in the Canadian health care system (DiCenso, Ciliska, & Guyatt, 2005). In terms of cardiac health, there has been much investment in developing and enhancing medical standards of care for patients admitted to acute care hospitals. However, once a patient has been diagnosed and received the necessary acute care treatment, secondary prevention is an important factor in reducing the risk of recurrent cardiac events and mortality (Champlain CVD Prevention Network, 2008). Secondary prevention includes long-term medication use and risk factor modification. Regrettably, there are a variety of barriers that have stalled the implementation of comprehensive risk factor modification services in acute care settings. Such barriers include the emphasis on acute treatments, early discharge, limited time, a lack of defined programs and providers for modifying risk behaviour, and a lack of counselling skills among health care professionals (Pearson & Peters, 1997). The consequence of this gap in care delivery is that patients are often unprepared for the transition between the acute care setting and home and are, therefore, at increased risk of experiencing adverse events (Coleman, Parry, Chalmers, & Min, 2006; Ho et al., 2010; Jackevicius, Li, & Tu, 2008; Makaryus & Friedman, 2005; Pearson & Peters, 1997).

In terms of cardiac health care, efforts have been made to address risk factor modification after discharge. For example, acute coronary syndrome (ACS) best practice guidelines recommend instituting cardiac health and rehabilitation programs in all regional centres. Such programs are recognized as the best practice for promoting long-term risk factor modification in relation to cardiac health (Braunwald et al., 2000; O'Gara et al., 2013). Unfortunately, in practice, cardiac health and rehabilitation programs are grossly underused with only 15%–25% of eligible patients participating (Williams et al., 2006). Moreover, these programs traditionally do not provide direct support during the initial vulnerable time of transition from hospital to home. This reality emphasizes the importance of the education provided to cardiac patients at discharge. In many cases, this phase of education is the only source of professionally delivered health teaching and risk factor modification counselling a patient receives, and its value should not be underestimated. Arguably, given this reality, a model of care is needed to guide discharge teaching practices used in acute care settings in order to promote successful knowledge transfer and enhance outcomes. In this paper, the authors critically analyze the concept of, and best evidence related to discharge teaching and identify and examine models for providing effective discharge education by health care professionals in acute care settings.

Why is Discharge Teaching Important

The experience of transitioning from an acute care setting to home is a critical point in a patient's illness experience that is often overlooked. On discharge, a person loses the title of patient and much of the resulting professional support that is associated with it. The former patient is expected to have the knowledge and confidence to assume the daily responsibility of monitoring and managing his or her new or changed health status. The number of post-discharge complications may be one indication that patients are struggling to manage complex self-care requirements and discharge plans in the community. It is currently estimated that one in five patients experiences complications due to adverse events after discharge, resulting in possibly preventable use of health care services such as primary care, emergency room visits and re-hospitalization (Agency for Healthcare Research and Quality, 2009; Clark et al., 2004; Jack et al., 2009). One reason for this might be that in fact, unfortunately, at the time of discharge, nurses and other health care professionals have an inability to accurately assess a patient's comprehension of discharge teaching instructions (London, 2009). Nevertheless, health care professionals often believe that they have provided adequate information when, in reality, they have failed to effectively communicate with the patient (Rothberg et al., 2010).

One consequence of not providing adequate support during the discharge phase of care is primary medication nonconcordance (Ho et al., 2010; Jackevicius et al., 2008; Newby, Dobesh, & Ashen, 2011). Ho et al. (2010) found that one in six cardiac patients delay filling their initial clopidogrel prescription after a cardiac event, which is associated with an increased risk of death or myocardial infarction within the initial 30 days following discharge. This behaviour has been associated with patients believing the medication is unnecessary or ineffective, the complexity of the care plan, and affordability issues (Jackevicius et al., 2008).

Interestingly, high-quality counselling consisting of individualized teaching sessions provided by a health care professional prior to discharge has been associated with an increased rate of observance of discharge care plans by patients, a reduction in mortality and rehospitalization, and decreased costs of care (Coleman et al., 2006; Jack et al., 2009; Jackevicius et al., 2008). These findings emphasize the importance of providing quality education to patients at the time of discharge. The apparent disconnection in communication between health care professionals and patients makes the fact that patients continue to demonstrate a desire for information related to their illness more alarming.

Gustafson, Arona, Nelson, and Boberg (2001) found that the information needs of patients overshadowed even their physical care needs, further indicating the perceived

importance by patients of education in acute care settings. In response to these needs, growing attention has been paid to improving discharge-teaching programs in some acute care settings. Such improvements have been associated with enhanced patient outcomes and reduced health care costs. Koelling et al. (2005), for example, found that for patients admitted with heart failure, instituting a nurse-led, one-hour teaching session prior to discharge resulted in a 35% reduction in the likelihood of re-hospitalization or death and a cost of patient care that was \$2,823 lower than that of the control group. Moreover, Clark et al. (2004) found that patients' satisfaction with the teaching provided at discharge was strongly correlated with overall satisfaction of their entire hospital experience. Frontline health care professionals are responsible for successfully preparing patients for the transition to self-care in the home setting. However, on closer examination of discharge from acute care settings, there appears to be a vast need and opportunity for practice improvements.

Discharge Teaching in the Acute Care Setting

Teaching in acute care settings generally consists of standardized content that is based on the diagnosis, as opposed to basing teaching on the patient's stated education needs. In such a system the patient's participation is expected to be that of a passive receiver of information with the knowledge and the power being held by the health care professional. In acute care settings it is estimated that 40%–80% of what is taught to patients is forgotten immediately following teaching, and that 50% of the information that patients do remember is recalled incorrectly (Wizowski, Harper, & Hutchings, 2008). These statistics are usually attributed to factors such as the stress of an acute illness, an overload of new information (Reiley et al., 1996) and patients' education and literacy levels (Evanagelista et al., 2010).

Although such issues are important factors that affect a patient's ability to learn, arguably it is also time for health care practitioners to recognize that their teaching techniques may also impact this form of knowledge transfer. Until health care practitioners acknowledge that the teaching strategies that are traditionally employed in acute care settings are not based on best evidence, little progress can be made toward improving patient outcomes after discharge.

Discharge Teaching: Relevant Models and Debates in Nursing Research

Patients ultimately decide what recommendations they incorporate into their lives. It is, therefore, imperative that health care professionals actively work toward establishing teaching and counselling practices that value patients' perspectives and encourage them to be active participants.

Popular evidence-based concepts and theories that would favour such a shift in philosophy are *adult education*, *patient-centred care* and *self-management*.

1. The philosophy of patient-centred care re-orientates the health care practitioner from an authoritative power role to a facilitator of information, with power being shifted to, or shared with the patient. Under this approach, patients are encouraged to be active participants and are the ones who set the agendas for learning and care plans (Bodenheimer, Lorig, Holman, & Grumbach, 2002; Registered Nurses Association of Ontario [RNAO], 2010). Standardized care strategies based on disease are replaced with strategies that are individualized towards the attitudes, beliefs, culture and preference of patients and their family (Bodenheimer et al., 2002; RNAO, 2010).

2. The five As multi-model is one example of how the concepts of self-management have been operationalized to produce a practical framework that can be applied to direct risk factor behaviour interventions; the five As are assess, advise, agree, assist and arrange (Glasgow et al., 2002).

3. Inquiry into the unique characteristics of adult learning has resulted in a comprehensive understanding of the features that affect the successful acquisition of knowledge by adults. Knowles, Holton, & Swanson's (2005) theory of adult learning is based on six assumptions that contrast traditional teaching methods that are often currently employed in health care settings. This alternative approach to learning dramatically affects the manner in which teaching is delivered and the roles played by the teacher and the learner.

These three bodies of literature were selected to inform the design of the framework for The Important Elements of Effective Discharge Teaching specifically because they re-orient the health care practitioner from an authoritative power role to that of a facilitator of information, with power being shifted to, or shared with, the patient. A review of this literature resulted in the identification of common themes that were directly related to providing effective discharge teaching in acute care settings. These themes include assessment, individualization, evaluation and reflection, and motivation and self-efficacy.

Assessment

According to self-management theory, the process of assessment is an essential first step when engaging a patient for the purpose of teaching. From a self-management perspective, the health care professional's assessment of the patient is a means of establishing a therapeutic relationship and should involve active listening, responses to the patient's concerns, and the establishment of trust, respect, and empathy (RNAO, 2010). In particular, London (2009) suggests that the process of assessment acknowledges and validates a patient's previous experiences and

allows teaching to be tailored to the individual's specific learning needs. In addition, it helps to identify patients' misconceptions and creates the foundation for an open dialogue.

Assessment is essential to a successful patient education interaction and is consistent with Knowles et al.'s (2005) adult education model. Adults need to understand why new learning would be valuable and be treated as being capable of making their own decisions. By first assessing the patient, the health care professional can determine what a patient already knows and then help him or her to understand why new learning would be valuable. Additionally, by initiating the patient education process with an assessment, a foundation is created for the incorporation of the principles of patient-centred care. The incorporation of the principles of patient-centred care speaks directly to Knowles et al.'s (2005) model and the principle of *Self Concept*. Involving patients in the process of goal setting with regard to discharge learning needs helps establish the patient as being in control of his/her learning. Active patient involvement in goal setting also helps to engage the learner and keep teaching patient-focused.

Individualization

Both patient-centred care approaches and self-management strategies demand that the health care practitioner deliver individualized care. Acknowledging that all learners are individuals allows for the abandonment of standardized teaching methods and content and provides the opportunity to tailor teaching to a patient's specific needs. To truly individualize care, all teaching resources must be used in conjunction with face-to-face interaction with a health care professional (Wizowski et al., 2008). From adult education theory it is known that adults prefer non-authoritative forms of education and resent having the views of others imposed onto them (Knowles et al., 2005).

This knowledge has led to a call for the return of conversation to patient teaching interactions (London, 2001). Indeed, engaging in conversation with the patient, as opposed to a traditional lecture format, is an essential element of patient-centred care and provides a non-authoritative manner in which to deliver health information (RNAO, 2006). This approach provides patients and families with the opportunity to participate by asking questions and discussing how illness and subsequent lifestyle changes will affect daily living. Using conversation as a teaching method allows the health care provider to reinforce important health teaching, clarify issues and take advantage of teachable moments. According to adult learning theory, adults become ready to learn when they perceive a need. Therefore, when a patient or family member asks a question, or appears interested, it is a clue that he or she is ready to hear new information making this an ideal time to engage

a patient (London, 2009). Strategies like reflective listening, open-ended questions and positive affirmation are used to help a patient identify his or her health goals and the required behaviours necessary to make lifestyle changes. These strategies help to strengthen the therapeutic relationship and are central components of patient-centred care (RNAO, 2002).

Evaluation and Reflection

Evaluation is an essential component of both patient-centred care and self-management theory. Patient-centred care models characterize evaluation as a specific process that provides continuous feedback from the patient's perspective (RNAO, 2006). From a self-management perspective, evaluation is a communication technique that ensures a patient understands the information that he or she has received (RNAO, 2010). Health care providers are notoriously guilty of not evaluating a patient's learning (London, 2009). It is, thus, important for health care providers to be conscious of the fact that teaching does not necessarily result in understanding (London, 2001).

The concept of health literacy is used to describe this occurrence in part. Health literacy is the ability of an individual to receive, comprehend and act on medical instructions (Wizowski et al., 2008). More factors than just the patient's level of education and reading ability affect health literacy; it is also influenced by the experience of stressful events and environments, the use of medical jargon and situations that are often foreign in extent and explanation (Comerford, 2004). As a result, evaluating a patient's understanding of information is imperative during discharge teaching because erroneous assumptions regarding what was understood have the potential to create harmful circumstances following discharge. However, simply asking patients if they understood or if they have any questions is not an accurate means of evaluating patients' learning (RNAO, 2010). Evaluation should consist of using "teach-back" techniques, which require patients to demonstrate utilization of the information they have received. Examples of teach-back techniques include asking questions such as: "I want to make sure I explained things clearly...; How would you explain that to...; Show me how you would...; What would you do if...; and Who would you call if..." (London, 2009, p. 64). Evaluation of patient learning is an essential step to ensuring the comprehension of important self-care instructions and the provision of effective discharge teaching.

Motivation and Self-Efficacy

The final common theme identified after reviewing patient-centred care, self-management and adult education theories are the concepts of motivation and self-efficacy. Motivation can be defined as "the extent to which people engage in a particular behavior" (Falvo, 2011, p.

59), and self-efficacy can be defined as the patient's level of confidence in performing specific tasks (London, 2009). These concepts are related—in order for patients to be motivated to create lifestyle changes, they must first believe that they are capable of making the required changes. Engaging patients in conversation regarding behaviour change and including them in setting goals to achieve such change are important first steps in building patients' self-efficacy. Assisting patients to break down long-term goals into smaller, more manageable short-term goals is also an effective way to help build confidence (RNAO, 2010).

Some strategies that can be used by health care professionals to help build self-efficacy include allowing patients the opportunity to successfully perform self-care while still in a formal care setting, providing patients with

opportunities to see others perform a specific task successfully, and providing direct encouragement (London, 2009). Another strategy is to provide patients with resources in either written form or via human contact, which patients can refer to if questions or obstacles occur once in the home setting (RNAO, 2010).

Toward a Framework for Action

Many nurses in acute care settings recognize that strategies related to patient education need to be improved. However, they do not have specific tools or frameworks to guide their practice. Nurses, therefore, need access to resources that assist with practical application of research. Realizing this need resulted in the knowledge gained through the above literature review being organized to produce a framework for use by staff nurses in acute care settings to guide

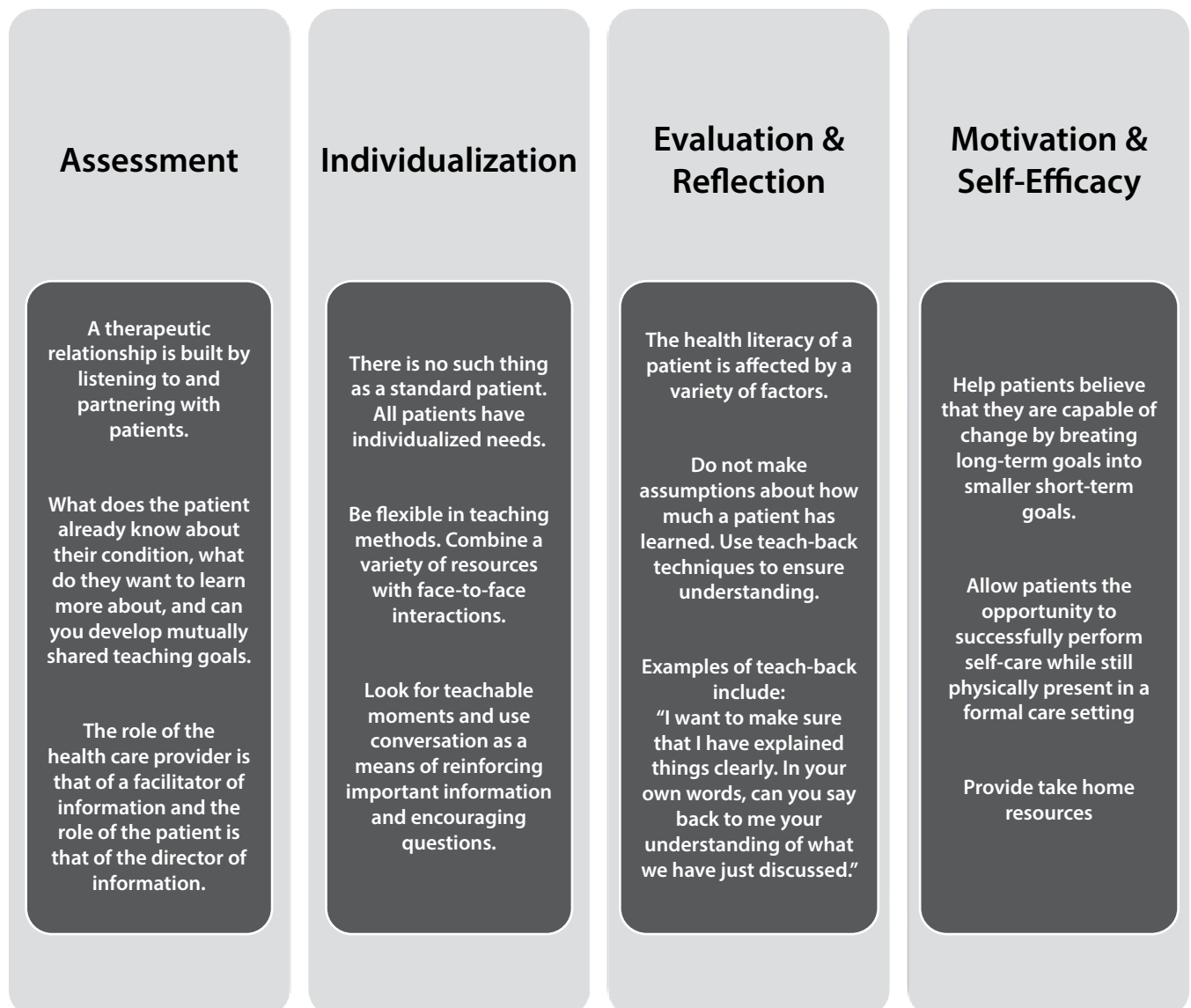


Figure 1: Important Elements of Effective Discharge Teaching

discharge teaching practices. The developed framework is not intended to be definitive, but rather the intention is to offer one conceptualization and organizing scheme for knowledge related to providing effective discharge teaching. One significant perceived barrier to providing patient education in acute care settings is a lack of time (London, 2009). Therefore, the following framework is simple, since creating a complicated framework would not serve its intended audience. Moreover, the suggested framework does offer a significant shift from traditional diagnosis-based teaching. For example, when approaching a patient with a diagnosis of heart failure, instead of approaching the patient with a predetermined agenda, this framework could be applied to guide the session.

Starting education-focused interactions by first assessing a patient's current health knowledge related to the diagnosis of heart failure and self-management activities helps to establish a partnering relationship and dramatically changes the quality of the interaction. What does the patient already know and what does he or she want to know more about? Providing non-authoritative forms of education and engaging patients and families in conversations, as opposed to a lecture format, provides opportunities for them to participate by asking questions and exploring how behaviour changes such as diet and activity can successfully be incorporated into their daily lives. Using conversation as a teaching method also allows the health care professional to reinforce important health teaching and takes advantage of teachable moments. The process of actively evaluating teaching/learning interactions helps practitioners ensure that their patients and families have truly understood the information provided and offers opportunities to correct any miscommunications. For example, after reviewing the signs and symptoms of heart failure with a patient to ensure understanding, the health care professional may say, "I want to make sure I have done a good job going over this information. In your own words can you tell me what signs and symptoms of heart failure you will look for when you are at home." Lastly, addressing patients' self-efficacy related to performing health activities is imperative to helping them achieve the motivation to follow through with healthy lifestyle changes and perform self-care activities. One example would be to encourage patients with a diagnosis of heart failure to independently track their daily weights while still in a supportive hospital environment. The important elements of effective discharge teaching are summarized in Figure 1.

Summary

The goal of discharge teaching is to provide patients with the necessary tools to make informed decisions, perform self-care and identify and respond to adverse events (London, 2010). Ensuring that patients have such tools and skills at the time of discharge requires a fundamental shift in how

teaching is currently performed and also a renegotiation of the roles that are played by the health care practitioners and patients. Improving discharge teaching also requires appreciation of the principles of adult education, as well as elements of both patient-centred care and self-management theories. The Important Elements of Discharge Teaching framework outlines practical strategies that can be incorporated into practice in order to enhance the quality of discharge teaching provided in acute care settings.

The process of being discharged from the hospital is an important element of a patient's illness experience. However, patients are often discharged with complex discharge plans that can be overwhelming and difficult to follow (Clark et al., 2004; Gruman et al., 2010). Paying attention to and reforming the manner in which health teaching is provided to cardiac patients at discharge has the potential to not only improve individual patient outcomes, but also to extend to larger system-wide improvements including reduced emergency room visits and decreased costs of care (Agency for Healthcare Research and Quality, 2009).

The Important Elements of Effective Discharge Teaching framework offers specific, evidence-based guidance that nurses and other health care professionals can incorporate into their practice in order to improve the quality of teaching they provide at discharge. It is hoped that the authors will stimulate debate and encourage health care professionals to critically analyze the discharge teaching practices and programs currently used in their clinical settings. Caring for the health of cardiac patients should not end at the completion of their acute treatment. If improving cardiac health is truly our goal, then, as health care practitioners, we should be dedicated to improving not only our technical skills, but also our education and counselling skills in order to empower our patients to create health outside of health care institutions. ♥

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Do you want to get more involved with CCCN and participate in its governance? Why not join a local or national committee? This is a great way to learn about the council and a great stepping stone for serving on the Board of Directors.

The benefits also include hours toward your certification and continuing competency. These activities and positions held can also be included on your CV. For more information and to join a committee please contact Jackie Murray, Membership Chair at jackie.murray@fraserhealth.ca or your Provincial Chair.

Writers needed

Have you thought about publishing something during your career? Why not try by starting small in a non-threatening way. We need authors to write the “Did You Know....?” column in each issue of the CJCN.

This column is intended to be a brief snapshot of new research findings and how they may relate to clinical practice. The length can be just a paragraph. This is not a peer-reviewed column. The editor will edit it. If you are interested, please contact Paula Price at pprice@mtroyal.ca.

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Canadian Council of Cardiovascular Nurses

The Canadian Council of Cardiovascular Nurses (CCCN) was founded in April 1973, and incorporated in July 1994. The CCCN is a national body composed of 10 provincial divisions, each with its own executive and committee structure.

The Canadian Council of Cardiovascular Nurses represents Canadian nurses interested in heart health and/or practising in the cardiovascular field. The Council is dedicated to promoting and maintaining high standards of practice relating to cardiovascular health. In order to maintain these standards, a continuing acquisition of knowledge, skills and attitudes is essential.

The mission of the CCCN is to advance cardiovascular nursing through education, research, health promotion, strategic alliances and advocacy.

Our objectives are to:

- identify current profiles and needs of cardiovascular nurses to effectively recruit and sustain members
- develop and maintain administrative and financial infrastructures that support strategic directives
- foster a sense of inquiry by supporting research opportunities and sharing findings in the cardiovascular nursing field
- develop an education strategy for cardiovascular nursing
- enhance the cardiovascular health of Canadians through health promotion and advocacy.

Benefits of membership

- Subscription to Canadian Journal of Cardiovascular Nursing, the Council's peer-reviewed journal
- Reduced registration fees for the Annual Meeting and Scientific Sessions of the CCCN and the Canadian Cardiovascular Congress
- Reduced registration fees for professional education seminars and workshops addressing a variety of current topics and issues in cardiovascular nursing
- Eligibility for continuing education units (CEUs) at the CCCN Scientific Sessions
- Eligibility to apply for CCCN Research Grant
- Liaison with the Canadian Nurses Association and other key leadership organizations in Canada and internationally
- Eligibility for the CCCN Clinical Excellence, Leadership and Research Awards and to nominate your peers
- Access to CCCN's website and membership area, including electronic copies of the journal, certification updates and other news

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