Cardiac Assessment for nurses part one

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Over the last fifteen years numerous political drivers have paved the way for the development of new and innovative models of practice within cardiac care. Many of these new models of practice requires practitioners to perform detailed and comprehensive cardiac assessment.

This paper offers practitioners an opportunity to develop and augment their knowledge and understanding of cardiac assessment. It suggests a systematic model that may be used in clinical practice.

Key words
Cardiac assessment, clinical assessment, holistic care, advanced roles.

Introduction
Nursing within all specialties continues to face unprecedented growth and development. Since the early 1990s there has been a proliferation and expansion of nurses’ roles. The impetus for these developments has been multifactoral but it would appear that within cardiac care there are three main drivers. Firstly the reduction in junior doctors’ hours (NHSME 1991) has encouraged nurses to develop roles that have traditionally been performed by medical staff. The Scope of Professional Practice (UKCC1992) has been significant in enabling nurses’ role expansion and development. The implementation of the National Service Frameworks paved the way for innovative new models of practice to be developed and fostered the creation of new roles for practitioners, for example the development of nurse led thrombolysis (Quinn 1995). Many of these new roles and developments required practitioners to develop history taking and assessment skills (Hind et al 1999). It is increasingly acknowledged that the development of history taking and
assessment skills is a key component of role development. The ability to undertake and document a clear and concise systems assessment constitutes a major aspect of the clinical practitioner’s role. By expanding and developing this skill practitioners can ensure patients receive timely and appropriate interventions.

As practitioners enter the realm of patient assessment, so begins the integration of essential elements of clinical care, observation, empathic listening and the techniques of examining and assessing different body systems and the development of the process of clinical reasoning. Critical care practitioners are increasingly performing respiratory assessment in the critically ill patient (Cox and McGrath 1999).

However, a literature search using Medline and CINAHL databases revealed limited publications regarding cardiac assessment with only three published articles found: two American articles written in 1988 which concentrate specifically on auscultation (Becker & Stevens 1988 and Miracle 1988) and one British article aimed at critical care practitioners (McGrath and Cox 1998). Given the expansion and developments of nurses’ roles and responsibilities within all aspect of cardiac care it would appear timely and appropriate to revisit this topic and ensure its applicability to all practitioners caring for patients with a cardiovascular complaint.

The aim of this paper is to enable practitioners to develop a more holistic approach to the clinical assessment of the cardiac patient. It aims to develop practitioners’ knowledge and understanding of cardiac assessment and its applicability to the clinical environment. It will suggest a systematic model to utilise during assessment of the cardiac system. This model will introduce practitioners to the techniques of inspection, palpation, and auscultation.

**Anatomy and physiology**

An understanding of cardiac anatomy is essential in order to assist in understanding and interpreting physical assessment findings.
The heart spans the area from the second to the fifth intercostal space. The border of the right ventricle lies just below the junction of the septum. The right ventricle meets the pulmonary artery at the level of the sternum or the base of the heart. The left ventricle is tapered inferiorly and is referred to as the apex (Bickley 2003). The left ventricle comes closest to the chest wall at a point located just behind the junction of the fifth intercostal space. The location of the apex is clinically important because it produces the point of maximal impulse (PMI). The heart has four chambers (two atria and two ventricles) separated by the cardiac septum (Tortora & Grabowski 2000). The upper atria have thin walls in comparison to the thick walled ventricles. The primary function of the heart is to act as a pump. Blood is moved through the heart via specific pathways. Deoxygenated venous blood returns to the right atrium through three vessels: the superior vena cava, inferior vena cava and the coronary sinus. Blood in the right atrium empties into the right ventricle and is ejected though the pulmonic valves and into the pulmonary artery as the ventricles contract. The blood then travels to the lungs to be oxygenated. From the lungs the blood travels to the left atrium through the pulmonary veins. The left atrium empties blood into the left ventricle, which then ejects the blood through the aortic valve into the aorta and the systemic circulation.

The heart valves keep blood flowing in one direction through the heart. Healthy valves open and close passively as a result of pressure changes. Valves between the atria and the ventricle are called the atroventricular valves and include the tricuspid valve on the right side of the heart and the mitral valve on the left side of the heart. The semi lunar valves include the pulmonic valve between the right ventricle and the pulmonary artery and the aortic valve between the left ventricle and the aorta. Every time the heart valves close they produce vibrations called heart sounds (Bickley 2003). These sounds can be heard on auscultation and are directly related to the cardiac cycle.
The cardiac cycle consists of systole and diastole. Systole is the period of ventricular contraction. As pressures within the ventricle rise the mitral and tricuspid valves snap shut and produce the first heart sound: S1 (Bickley 2003). Pressure continues to rise in the ventricles. When the pressure exceeds the pressure in the aorta and pulmonary artery the aortic and pulmonic valves open and blood is ejected from the ventricles. After ejection ventricular diastole begins. As the ventricles relax the pressure in the ventricles falls below the pressure in the aorta and the pulmonary artery. This pressure differences cause the aortic and pulmonic valves to snap shut causing the second heart sound: S2 (Bickley 2003).

Assessing the Cardiac system.

Assessment of the cardiac system requires a logical and objective approach. This will ensure that clinical findings can be clearly linked to diagnostic reasoning and the patient care plans. Place and Graham (2000) argue that assessment skills are an essential prerequisite for practitioners caring for acutely ill patients. Arguably timely and appropriate intervention and management are applicable to patients with chronic cardiac conditions thus highlighting the value of developing assessment skills when caring for patients with acute and chronic conditions.
The Bates Model (Bickley 2003) provides practitioners with a systematic method of assessing the cardiac system. Bates recommends a comprehensive four-step approach to patient assessment. These four steps involve: inspection, palpation, percussion and auscultation. This article will discuss inspection, palpation and percussion. Part two of the article focuses on auscultation.

Before commencing a detailed cardiac assessment a general examination of the patient should be undertaken. Patients’ height, build and weight should be noted. For example, is there evidence of weight loss, which may be indicative of diabetes or hyperthyroidism, both of which place extra burdens on the cardiac system. Evidence of weight gain may reflect heart failure. Breath odours may also be useful diagnostically for example the pear drop smell associated with diabetes or the smell of alcohol or nicotine. These pathologies are strongly linked to coronary heart disease risk factors. The patient's colour should be assessed. Central cyanosis is best observed in the lips, oral mucosa and the tongue. However increased melanin might mimic cyanosis in darker skinned individuals. The red colour of oxyhaemaglobin should be noted and pallor due to its absence. The best locations for this are fingernails, lips and the mucus membranes. Pallor may indicate hypovalaemia or anaemia with a concomitant decrease in the red blood cells’ oxygen carrying capacity, whereas central cyanosis indicates ventilation perfusion mismatch and implies serious heart or lung disease. Peripheral cyanosis indicates vasoconstriction, for example a physiological response to a cold environment or may reflect a pathological response to low blood flow to peripheries such as cardiogenic shock. Careful observation of the skin may also indicate other abnormalities associated with cardiac pathologies – jaundice for example may present in the sclera as well as appearing in the lips, hard palate, under the surface of the tongue and may be indicative of hepatic engorgement as a result of right ventricular failure.

**Inspection**

The importance of inspection in relation to cardiac assessment cannot be underestimated. Often the most underused of the assessment techniques a detailed inspection may offer an immediate diagnosis.
Certain cardiac conditions may be reflected in patients’ facial expressions or skin appearance (Marsh 1999). Elfin facies are characterised by a short upturned nose, widely spaced eyes, full cheeks, deep husky voice and is often associated with congenital aortic stenosis (Marsh 1999). Head bobbing with each heartbeat (De musset's sign) is associated with severe aortic regurgitation (Woods et al 2005). Corvisart’s facies is characteristic of patients with aortic regurgitation or heart failure. Patients’ faces are puffy and purplish with swollen eyelids and shiny eyes. Patients with mitral stenosis often have a pink face and slightly cyanotic cheeks. Excessive dryness of the skin, sparse hair and loss of lateral eyebrows and periorbital puffiness may be indicative of myxedema. The myocardial effects of this auto-immune disorder are a reduced cardiac output and heart failure may develop in patients with hypothyroidism. Xanthoma lesions may be present on the eyelids as yellow plaques or as tuberous nodules on the elbows and knees. These lesions are due to deposition of fat in the connective tissue cells and are associated with hyperlipidemia.

**Palpation**

Palpation should include assessment and inspection of the nail beds. Clubbing may be seen in patients with chronic cardiac conditions, for example infective endocarditis and cyanotic congenital heart disease. The soft tissues of the terminal phalanx are affected and result in an increase in the angle between the nail plate and the nail fold. The proximal nail fold when palpated feels spongy. 75% of clubbing is associated with pulmonary pathology, 10% is cardiac in origin and 10% is associated with hepatic and gastrointestinal conditions (Jefferies and Turley 1999). The nails should also be inspected for other signs of cardiac disease for example evidence of splinter haemorrhages (small linear haemorrhages under the nail bed that are splinter like) and can indicate the presence of infective endocarditis. Red painful transient swellings on the pulp of the fingers and nodes are called Osler nodes and are also associated with infective endocarditis.
Skin mobility and turgor can be assessed by lifting a fold of skin and observing the ease in which the skin lifts up (mobility) and the speed in which it returns into place (turgor). Decreased mobility is evident in oedema whilst decreased turgor is observed in dehydration. The capillary refill test is also a helpful indicator of fluid status and is performed on the nail beds it monitors tissue perfusion and dehydration. Pressure is applied to the nail bed until it turns white, pressure is then removed. A pink colour should return in less than 2 seconds after blanching. Blanch times that are greater than 2 seconds may indicate the following:

- Dehydration
- Shock
- Peripheral vascular disease (PVD)
- Hypothermia

Palpation of the skin can also demonstrate the presence of oedema. Oedema can be classified as either pitting or non-pitting. Non-pitting does not depress on palpation and is indicative of a localised inflammatory response and the skin is also red, warm and tender. Pitting oedema is found in the dependent body parts and the depression made on palpation remains. Pitting oedema is indicative of congested cardiac failure.

Pulses should be palpated and information on the rate, rhythm and amplitude is obtained. Usually the radial artery is assessed to determine rate and rhythm, however certain clinical conditions such as shock may make use of the radial pulse redundant because of the low pulse amplitude associated with these types of clinical conditions. The carotid pulse should be used in these situations (Woods 2005). A low pulse volume implies a decrease in cardiac output. A high pulse volume may be described as bounding and is associated with high cardiac output states, for example anaemia, or hyperthyroidism. Corrigan’s pulse or water hammer pulse is associated with aortic regurgitation and is described as bounding and is seen in aortic regurgitation where there is a rapid rise in the pulse followed by a rapid fall (Mangione 2001). Bisferiens pulse is a combination of slow rising and collapsing pulse and is indicative of aortic stenosis with regurgitation (Marsh 1999). Pulses alternans is a regular
rhythm in which strong pulse waves alternate with weak pulses; this is an ominous sign and suggests serious cardiac disease (Woods 2005).

The carotid artery should be inspected and palpated. Normally a brisk localised pulsation would be seen. It is important to familiarise yourself with the landmarks of the neck and learn to recognise and identify the carotid and the internal jugular vein. This is imperative if you intend to assess and measure the jugular venous pressure. Inspection of the left internal jugular vein provides valuable information about the volume status of the right ventricle. It reflects right ventricular diastolic pressure and cardiac function (Bickely 2003). Estimation of the jugular venous pressure (JVP) is one of the most important skills underpinning cardiac assessment. Assess the right side of the neck because the right heart dynamics are transmitted more directly to the right internal jugular. To measure the JVP follow these steps:

- Elevate the head of the bed to 30° and turn the patient’s head slightly away from the side you are inspecting
- Observe the junction of the sterncleidomastoid with the clavicle and then look up along the route for the jugular veins and observe for any visible pulsations
- Palpate the pulse. If you can feel the pulse then it is probably the carotid artery - venous pulses are extremely difficult to palpate
- Identify the highest point of pulsation in the right internal jugular veins. Extend a long rectangular object for example a tongue depressor horizontally from this point and a centimetre ruler vertically from the sternal angle making an exact right angle. Measure the vertical distance in centimetres above the sternal angle.
If the top of the neck veins is more than 3cm above the sternal angle then the JVP is abnormally elevated (Woods 2005). An elevated JVP may indicate right ventricular failure, reduced right ventricular compliance, obstruction of the superior vena cava and fluid overload.

Palpate the precordium for the apex impulse more commonly referred to as the point of maximal impulse (PMI). This impulse represents the brief early pulsation of the left ventricle as it moves anteriorly during systole and touches the chest wall (Bickley 2003). The PMI is normally located in the fifth intercostal space medial to the midclavicular line. Assessment of the PMI is a useful diagnostic tool because it gives an indication of how well the left ventricle is functioning. This impulse may be difficult to palpate in obese patients as asking patients to roll onto the left side makes the PMI more accessible and therefore easier to palpate. With practice and experience you will learn to locate the PMI in the majority of patients. Once you have located the PMI assess the location diameter and amplitude of the impulse. A normal impulse is felt as a light tap extending over 1cm. An area greater than 3cm should be considered pathological and usually reflects left ventricular enlargement (Mangione 2001). A diffuse impulse and an increase in amplitude with lateral displacement suggests an increased volume overloaded left ventricle. An impulse that is sustained, enlarged and laterally displaced suggests a pressure overloaded left ventricle as seen in patients with aortic stenosis.

**Percussion**
Cardiac examination often neglects cardiac percussion; the advent of sophisticated diagnostic tools has made this examination technique increasingly redundant. However, cardiac percussion can still provide useful information on the cardiac borders and with the exception of chest X-rays is the most reliable method of assessing the heart size (McGrath & Cox 1998). Begin by percussing the anterior axillary line and continue toward the sternum along the fifth intercostal space. The sound will change from resonance to dullness over the
left border of the heart. The right border of the heart is usually aligned with the sternum and therefore cannot be percussed.

**Conclusion**

Within cardiac nursing, political drivers and advances in technology are compelling nurses to develop and expand their scope of practice. Increasingly, developing complex assessment skills is seen as an imperative for practitioners located within the cardiac care environment. This paper has presented a systematic model that practitioners may find useful to adopt within their clinical practice. A thorough and detailed cardiac assessment of patients is essential to ensuring a holistic and comprehensive model of care is delivered. Part two of the article will discuss and describe auscultation.

**Key Points**

- Nurses are increasingly developing complex and advanced roles
- Respiratory assessment is now considered integral to the scope of practice of the critical care practitioner
- There is a paucity of literature relating to cardiac assessment.
- Practitioners should begin to incorporate cardiac assessment into their repertoire of clinical skills
References


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