

AN INFECTION CONTROL EDUCATIONAL PROGRAM

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By

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ABSTRACT

This project describes the development of a curriculum for an infection control liaison program to be implemented in a large, regional health care institution. A curriculum module was designed to both support and challenge practising nurses to utilize critical thinking skills to guide their decision making regarding infection control practices. The author describes the process of curriculum development and presents a final curriculum product. The implementation is presented to demonstrate that the teaching of factual knowledge and skills can be integrated with higher level skills such as critical thinking, problem solving and decision making. Throughout this project, emphasis is placed on educational theory and on the practising health professional as the learner.

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INTRODUCTION

The Context of the Project

The health care system has become increasingly complex. Such factors as decreased length of hospital stay, expanded technology, increased patient acuity, financial constraints and the use of unregulated health care workers dictate the need for professionally prepared nurses who are competent and capable of thinking critically (Dobrzykowski, 1994). This changing health care environment would suggest that health professionals should be able to solve complex problems. Adaptable strategies, flexibility, personal initiative and creativity are some of the skills that would assist nurses in particular to deal with these system complexities. Safe, competent, and skilful nursing practice requires critical thinking, problem solving and clinical decision making (Paul & Heaslip, 1995), and a curriculum dealing with any aspect of nursing practice should include these skills.

As professionals who must deal with rapidly changing situations, nurses cannot rely on routinized behaviours and procedure manuals to guide their practice and judgement. Nurses must develop the ability to make guided decisions drawn from sound, rational bases in order to respond

appropriately under the stress of fast-paced clinical environments.

Furthermore, knowing how to think, apply, analyze, synthesize and evaluate are crucial thinking skills which facilitate the use of the nursing process (Howenstein, Bilodeau, Brogna & Good, 1996).

The American Association of Colleges of Nursing (1986) has emphasized the need to prepare nurses who can think critically in order to process complex data and make intelligent decisions concerning patient care. Furthermore, the National League for Nursing (NLN) recognizes critical thinking as an essential component of nursing practice. NLN accreditation criteria now require schools of nursing to emphasize the development of critical thinking and progressively independent decision making in their curricula (NLN, 1991, 1992, 1993). Such mandates should result in curricula facilitating strong thinking abilities of new graduates. Practising nurses, however, should also be provided with opportunities to develop and improve their thinking abilities as well.

Through anecdotal evidence with more than 100 graduate nursing students, Degazon and Lunney (1995) found that practising nurses had little formal knowledge of themes and components of critical thinking, and had difficulty in applying these principles. Since several nursing researchers (Benner, 1984, Corcoran-Perry, 1986) have found high levels of critical

thinking ability necessary for advanced levels of competence, practising nurses should be involved in strategies for ongoing improvement in these abilities. Although this would benefit all areas of the nursing profession, it is imperative within the discipline of infection control.

Infection Control

Hospital-acquired (nosocomial) infections affect more than 4 million patients in Canada and the United States, and add billions of dollars annually to hospital costs (Gould, 1991). Recognition and control of nosocomial infections are important concerns for institutional risk management and hospital quality improvement programs because there is strong evidence that these infections prolong length of stay, increase hospital costs, and contribute to adverse patient outcomes (Martin, 1993, Tablan, 1995, Larson & Killien, 1992). Although many hospital infections are unavoidable due to underlying disorders and invasive medical procedures, a substantial proportion of nosocomial infections can be reduced by effective control measures (Martin, 1993).

The practice of first-line infection control has been shown to reduce the incidence and severity of nosocomial infections in patients (Gould & Ream, 1994). All health care practitioners share in the responsibility for patient care. Nurses however, are in a unique position to assess the

patient, monitor personnel activity, enforce hospital policy, and educate personnel and patients. In essence, nurses coordinate patient care. Since nurses comprise the largest portion of the hospital workforce and provide the majority of direct care services to hospitalized persons, nurses are the most qualified personnel to learn and practice the principles of infection prevention and control (Gould et al, 1994).

Currently in health care institutions, infection control practitioners are usually responsible for teaching the principles, appropriate practice and policy of infection control and prevention, and monitoring the application of these practices. The Senic Study (1978) conducted in the United States recommended a ratio of 1 Infection Control Practitioner per 250 patients. However, in reality, most large urban hospitals in Canada have 1 Infection Control Practitioner per 500-600 patients or more. Clearly, this increased ratio would decrease the effectiveness of the role and any infection control countermeasures. Thus, many centres must find alternative ways of dealing with infection control measures. Furthermore, hospital policies and guidelines must give nurses the authority to monitor and address this very important area of care. The proposed curriculum in infection control will address these needs by offering an educational program that deals specifically with infection control issues and thinking abilities.

Conceptualization of the Course

Upon completion of a basic nursing education program, and the Ontario College of Nurses' Registration examinations, the nurse receives a Certificate of Competence. A nurse is then said to be competent in providing safe nursing care to patients and their families. One must, nonetheless, recognize the limitations of this certification. In a basic undergraduate program, the nurse has been taught to provide general nursing care to patients with various conditions. However, basic nursing education cannot be dedicated to specialty education, such as infection control. Nurses need to be aware of the potential for transmission of infection in their practice setting and "take all measures necessary to prevent it" (College of Nurses of Ontario, 1996; 4). Infection control is integral to safe nursing practice and is a subject of direct relevance to clinical nurses. There is also evidence that nurses are interested in microbiology, and value opportunities to extend this knowledge (Canola, Kirkis, Meckes, & Pitts, 1994, and Mathews, 1991). However, the College of Nurses of Ontario (CNO) recognizes that registered nurses in many settings do not have ready access to infection control expertise, and recent guidelines have been developed to provide information about general infection control practices (CNO, 1996). For this reason, this project will

incorporate the CNO guidelines into a curriculum for teaching infection control practices to general staff nurses.

Since nurses come to the clinical setting from a variety of educational backgrounds and experiences, there is a need to standardize the infection control knowledge of nursing personnel (Goldrick, 1987). This project will present a standardized infection control curriculum for practising clinical nurses. The conceptualization of a curriculum to facilitate, encourage and enhance decision-making regarding infection control practices within the discipline of nursing is developed by utilizing the tenets of critical thinking. Rather than utilize a prescription for care in infection control, the curriculum will describe how nurses will be encouraged to apply principles, data and knowledge, and maintain flexibility as they deal with infection control issues posed by individual patients.

The proposed curriculum will follow the principles set forth by Lipman (1988; 39) who defines critical thinking as "skilful, responsible thinking that facilitates good judgement because it (a) relies upon criteria, (b) is self correcting, and (c) is sensitive to context". The process of decision-making used in this curriculum will also focus on the nursing process. In the nursing process, the nurse collects data utilizing both inductive and deductive reasoning, makes hypotheses (or inferential nursing

diagnosis), plans, implements and evaluates patient care. In fact, many of the cognitive problem solving skills needed to successfully implement the nursing process are analogous to the mental processes defined as critical thinking ability. In essence, critical thinking is the outcome achieved from deductive reasoning coupled with the problem-solving process.

CRITICAL THINKING

Definition

Critical thinking might be described as a contested concept (Pless & Clayton, 1993). There is a lack of clarity about just what critical thinking entails. Paul (1990) advises that one should not put too much weight on any particular definition of critical thinking, but rather retain a host of definitions as the concept is so complex. Various authors have put forth definitions of critical thinking relative to their specific discipline ie: psychology, philosophy, education. Similarly, various definitions of critical thinking emphasize its goals, its process, its methodology, its essential characteristics or its scope. One of the earlier definitions was that of Watson and Glaser (1964) who saw critical thinking as a composite of attitudes, knowledge and skills. Ennis (1991; 1) emphasizes that the focus of critical thinking is "deciding what to believe or do...based on reasonable, reflective thinking". For Ennis (1985), belief and action are connected, but are preceded by thinking through reflectively about what to do and what to believe. Furthermore, he believes critical thinking must fit or be related to the context. Seigel (1980; 7) defines critical thinking as being "appropriately moved by reasons and ...to generate and seek out good

reasons". Govier (1985; 70) defines critical thinking in a narrow, technical way as "thinking about another product of thought (an argument, claim, theory, definition, question, problem, comparison and much else) in a special, sceptically deliberate, evaluative way". This definition implies that critical thinking is a process of evaluating cognitive products and processes. Blair (1985; 70) identifies critical thinking as " an activity that applies to a lot more than arguments" and views its' usefulness as threefold:

First, there are certain concepts, tools or mechanisms that can be, and indeed must be employed everywhere, regardless of the subject matter or content...Second, the vocabulary or criticism contains terms which have general application, even if the specifics of their application vary from field to field....Third, certain habits of mind or disposition, and various habits of critical reaction, can transfer from one subject to another".

Paul (1984) makes a distinction between a narrow, weak sense and a broad, strong sense of critical thinking. He describes the narrow, weak sense as skills that can be tacked onto other learning, but remain extrinsic or external to the character of the person. In contrast, Paul's premise of the broad, strong sense of critical thinking, skills are integrated within the individual into the thinking and feeling processes and further emphasizes critical thinking skills as essential to the "free, rational, autonomous mind" (Paul 1984; 11). He sees the narrow aspect of critical thinking as consisting of formal, inductive, and informal logic while the broad

interpretation consists of the extension of logic to the rational examination of controversial social, ethical, political, economic and religious issues such as abortion, euthanasia and terrorism.

In addition, Paul (1990) believes that issues are either monological (having one logic or a single structure of rationality) or multilogical (having more than one logic, or alternative structure of rationality). The monological system prevails when one set of rules defines the system, such as a game of chess. Nurses who practice in traditional health care settings that operate only on a medical model, with medical rules of evidence and diagnosis are operating in a monological system. On the other hand, nurses who practice in a system that recognizes and supports two competing and also complimentary frames of reference, the medical model and the nursing model of using diagnosis and evidence, are operating in a multilogical system. Almost every important issue and system is multilogical. Yet nurses have been traditionally "trained" for a monological world, then thrown into a world which is multilogical. Bandman and Bandman (1990) believe that nurses and physicians must be trained to identify and analyze health care issues from the perspective of more than one point of view. Health care professionals who operate under a monological frame of reference are not able to examine the implications and evidence of their

view, able to argue against it, or able to construct a different point of view based on the use of critical thinking; they are unable to make the fundamental change requiring a new frame of reference (Bandman et al, 1990). These people see the world from only one perspective and are unaware of the variety of existing differences and possibilities.

Hence, a review of the definitions of critical thinking reveal similarities and differences. All of the theorists agree that critical thinking requires many cognitive skills, information and knowledge, and includes a dispositional or affective dimension. The most apparent differences among the theorists exist around the issue of whether the skills involved in critical thinking are generalizable. All seem to agree that the attitudinal factor is generalizable, and none deny the importance of information/knowledge, although they accord it different amounts of emphasis (Johnson, 1992). In summary, an inclusive definition of critical thinking will include three separate, but related components: cognitive skills, dispositions and information/knowledge.

Critical Thinking and Nursing

Presently, nursing is in a dynamic state of change; "defining its theory, practice and social mandate, and critical toward its present status" (Bandman et al 1990; 5). According to Thomas Kuhn (1970), change

occurs only when a field is in turmoil. The nursing profession is experiencing distress regarding its purpose in the health care system, educational preparation, practice, roles, research, theory, and its relation to medicine. Critical thinking helps us to identify, prioritize and argue important issues. Thus, effective thinking and problem-solving skills are required by health professionals, particularly nurses so that they may guide and influence the future of the health care delivery system. Furthermore, Toliver (1988; 175) believes that inductive reasoning and probability estimation constitute the basis for a large amount of every-day critical thinking.

Critical thinking is defined in this project as the rational examination of ideas, inferences, assumptions, principles, arguments, conclusions, issues, statements, beliefs and action. The examination covers scientific reasoning, includes the nursing process, decision-making, and reasoning in controversial issues. The four types of reasoning that comprise critical thinking are (1) deductive, (2) inductive, (3) informal or everyday and (4) practical (Paul et al, 1995). To elaborate on this initial definition, critical thinking is reasoning that we use to analyze the use of language, formulate problems, clarify and explicate assumptions, weigh evidence, evaluate conclusions, discriminate between good and bad arguments, and seek to

justify those facts and values that result in credible beliefs and actions. The following is a checklist of critical thinking functions in nursing:

- ◆ use the processes of critical thinking in all daily living
- ◆ discriminate among the uses and misuses of language in nursing
- ◆ identify and formulate nursing problems
- ◆ analyze meaning of terms in relation to their indication, their cause or purpose, and their significance
- ◆ analyze arguments and issues and formulate them into premises and conclusions
- ◆ examine nursing assumptions
- ◆ report data and clues accurately
- ◆ make and check inferences based on data, making sure that the inferences are, at least plausible
- ◆ formulate and clarify beliefs
- ◆ verify, corroborate, and justify claims, beliefs, conclusions, decisions and actions
- ◆ give relevant reasons for beliefs and conclusions
- ◆ formulate and clarify value judgements
- ◆ seek reasons, criteria and principles that effectively justify value judgements

◆ evaluate the soundness of conclusions

For the clinical nurse, critical thinking is required on a daily basis, and is, therefore an expected behaviour of professional nursing. However, a large number of novices exhibit deficits in critical thinking skills, especially in the clinical setting (Case, 1995). They experience difficulty in relating abstract ideas to concrete situations. Bandman et al (1990; 7) describe that these novices "seem to lack the prerequisite procedural knowledge that would enable them to recognize conditions, and in turn, know when to execute the appropriate nursing intervention". Since novice nurses are, for the most part, performance-oriented, and because critical thinking is a conceptual skill, and not a concrete action (Shank, 1988), it is difficult for them to understand its value. Furthermore, nursing practice frequently promotes and reinforces concrete thinking rather than critical thinking. The provincial registration exams are all in multiple choice format requiring rote answers. Similarly, technical competence in performing skills is highly revered in the workplace, again emphasizing the finished product rather than the process (Corcoran-Perry, 1986). Although technical skills are important and necessary, of equal or greater importance in the clinical setting, is the ability of the nurse to gather and interpret data from clients, use knowledge about human needs, and use his or her own observations of the client's

behaviour to problem solve and make decisions pertinent to nursing diagnosis (Paul et al, 1995). Implicit in such reasoning is information processing which allows individuals to generalize from specific experiences to form new concepts and apply theory to clinical practice. Dobrzykowski (1995) suggests that this ability to generalize is important in the nursing clinical practicum because learning from instruction may be largely an inductive process.

Consequently, it is crucial that novice nurses acquire the ability to examine the conceptual basis of nursing important for critical thinking. Wong (1979; 161) states that the inability to transfer classroom knowledge to clinical nursing practice is a common learning problem encountered by many nursing students. Manifestations of this problem may involve both the academic performance and personal development of the students, inability to solve problems in nursing situations; inflexibility and rigidity in the exercise of nursing care, fragmentation of nursing care and apathy towards clinical practice.

Ten years later, Bandman et al (1990) recount the same theme: "the ability of learners to transfer what they have learned in school to problems which they are likely to encounter outside of school should be the ultimate objective of schooling". Accomplishing this goal would enable those

novices to increase their general problem-solving abilities by acquiring domain-specific knowledge. The more domain-specific knowledge acquired, the better that knowledge is organized, thus increasing general reasoning skills. Degazon et al (1993) also agree that growth from beginning levels of competence to more expert levels is based on clinical experience. Clinical experience alone, or length of time in a position, however, is insufficient for development of expertise in nursing. Benner (1984; 178) interprets clinical experience not as length of time in a position but as a "very active process of refining and changing preconceived theories, notions and ideas when confronted with actual situations". The significance of critical thinking to nursing care is supported by the recent inclusion of critical thinking criteria for nursing program accreditation in the United States (National League for Nursing, 1993).

Critical Thinking and the Nursing Process

The nursing process provides scope for the independent, interdependent, and dependent roles of the nurse and as a means to demonstrate nursing accountability. Griffith and Christensen (1990; 4) view the nursing process as an adaptation of the scientific method to nursing and claim it is used by nurses to "diagnose and treat human responses to potential and actual health problems". As in other disciplines,

the scientific process is used by nursing along with theoretical frameworks to collect data and seek knowledge that is relevant and that guides practice effectively (Jones & Brown, 1993). This theory-based, scientific approach provides a "method and focus for data collecting, analysis of health patterns, diagnosis of client problems and selection of nursing implementation strategies" (Griffith et al, 1990; 4). The development of inferences is like leaping from what is known; the data, into what is unknown. This process includes using the data to hypothesize about the meaning of a patient's dysfunctional patterns or to make generalizations about the patient's functional state of health. In fact, most of the nursing process can be viewed as a series of means-ends relationships. The means are the nurse's accurate assessment, diagnosis and treatment of the patient, and the ends are the patient's increased level of function and well-being (Jones et al, 1993).

Assessment

The assessment phase of the nursing process includes two steps. The first step is the collection of data from primary and secondary sources. The second step is the analysis of the data as the basis for nursing diagnosis. The critical issue for the data collector becomes that of asking fundamental questions about the purpose, goals, and intent underlying the

use of the data (Carnevali and Thomas, 1993). Even if the purpose of the data collection is to use the nursing process to arrive at a nursing diagnosis and treatment plan that can be implemented and evaluated, the data still need to relate to the client's perceived needs and health problems, goals, values, and life-style. To be useful, data collection, as Charles Darwin observed, must be for or against a particular hypothesis. However, the patient's goals go no further than immediate relief of pain and discomfort, hospital discharge and a return to previous functioning. Yet a common practice of nurses is to collect voluminous data, especially psychosocial data that are interesting, but only remotely relevant to the health problem at hand (Jones et al, 1993). For example, the sexual patterns, marital relationship and financial status of a client with acute abdominal pain, facing surgery may be of little or no relevance.

The nurse's entry into the assessment situation provides the opportunity for a quick overview (Carnevali et al, 1993). The nurse's scan of a patient will usually relate to their specialty or the treatment situation. Necessarily, other clues and other possibilities may be neglected in this intense focus on the initial scanning. Out of the initial scanning, urgent actions or priority needs may arise in order to stabilize the situation. Or there may be a need to collect more data. Throughout the data collection

process, the nurse will cluster cues, identify emerging patterns and potential problems (Jones et al, 1993). Perceived cues tend to come together in chunks or clusters of related material. The extent of the nurse's perception of cues and grasp of their meaning is directly related to the nurse's knowledge and experience (Carnevali et al, 1993). Out of these clusters and chunks, the practitioner generates diagnostic hypotheses through the inferential process beginning with that which is most important to the patient's health and survival. All hypotheses are tentative and competitive, both general and specific. The critical thinker seeks to rule out the obvious and preliminary hypotheses in the process of collecting new data to substantiate or rule out surviving hypotheses (Jones et al, 1993).

Nursing Diagnosis

All data collection and diagnostic reasoning processes make use of inferences. Inferences are defined as the movement of thought that proceeds from something given, a cue or data, to a conclusion about what that data means or signifies (Barnum, 1994).

According to Gordon (1994), the diagnostic phase of the nursing process, comprises four activities: collecting information, interpreting information, clustering information, and naming the cluster. Gordon (1994; 32) views the diagnostic process as "a cycle of perpetual and cognitive

activities of observations leading to inferences, and inferences leading to further observations until the nurse is able to name the problem". The use of the diagnostic process by which cues are clustered and chunked, data evaluated and hypotheses generated is in Gordon's opinion clinical reasoning, inference and judgement. Analysis of assessment data can yield judgements of normality or abnormality. Beyond these gross distinctions, interpretation of the meaning of the data calls for inferential reasoning, the process by which new meaning is attached to known clinical data. In essence, making an inference means to go beyond the data to make a judgement by way of elaborating the meaning. Thus, nursing diagnosis is not only a classification, but inference to an unknown, unseen process that has outward, verifiable criteria (Jones et al, 1993).

Planning, Implementation and Evaluation

Once nurses establish the diagnosis and the etiology, they set out to manage the problem with nursing interventions (Gordon, 1994). The planning phase involves strategies and means-ends thinking. Once the ends of a patient's diagnosis, situation and recovery program are set, the means, such as the required nursing interventions are put into motion (Jones et al, 1993).

Nursing implementation or intervention normally follows the planning

phase and consists of a methodical, systematic, scientifically based patient care plan. The last phase, evaluation, is concerned with how effective the initial assessment, diagnosis, planning and implementation were. In this evaluative process, standards and procedures of critical thinking play an important role (Carnevali et al, 1993). Formative evaluation is used throughout this process, followed by summative evaluation at the end.

At this time in nursing, there does not seem to be sufficient agreement on professional goals, purposes and methods from one theory to be used as a basis for all practice, research and education. The use of critical thinking, however, with whatever theory or process selected, will enhance the validity, reliability and worth of nursing outcomes to patient and practitioners (Jones et al, 1993). Critical thinking is concerned with the appropriateness of the completed process itself rather than with the psychology or the formulated stages of the nursing process independently. Criteria of critical thinking such as the rules of validity, soundness and rigor should always apply to the phases of the nursing process.

Critical Thinking and Decision-Making

The end-point of using critical thinking and scientific reasoning in problem resolution is making a decision. All thought and actions culminate in some kind of decision. It can be argued that even no decision is a

decision because in effect, it supports the existing state of affairs (Mechanic, 1991). Thinking critically is essential since the conclusion may open up possibilities for several different decisions. Each step in the decision making process needs critical appraisal with respect to the soundness, accuracy, and adequacy of the unstated premises or presupposition of the problem statement (Linn, Pulus & Gans, 1981). Information gathered must be relevant, accurate and adequate. Possible conclusions need to be tested as arguments by the logical doctrines of validity, soundness and importance. If-then conditional statements need critical appraisal so that the conclusion is a valid and sound argument (Seigel, 1988).

It is advantageous for nurses to participate in decision making on the basis of critical thinking, logic, value choices and degrees of certainty and risk (Holland, Holyoak, Nisbett, & Thagard, 1986). Nurses have countless opportunities to make important decisions significant to the lives of patients, families, groups, organizations, communities and themselves in the course of their personal and professional lives. However, one must ensure that these decision are appropriate and sound. The use of critical thinking in this process offers nurses the opportunity to decide wisely and on behalf of the well-being of others as well as their own benefit and professional

satisfaction (Mendelsohn & Schwartz, 1987).

A six step progressive format for decision making is offered as a general guideline (Appendix 1). The use of the format does not commit the nurse to an invariable sequence of steps, but rather, like any ladder, one freely moves up and down the steps in the process of reaching one's goals. Utilization of such a process can lead to a conclusion that is informed and supported by evidence and by reasons (Moore et al, 1985).

Identifying the Problem

Some problems are obvious. However, in most situations, problems are not what they appear to be (Mechanic, 1991). Nurses face complex patient care situations on a daily basis that are often difficult to manage. They are not the clean, well-delineated case study situations presented in academia; rather they are the messy, practical situations that present themselves as crises. Situations occur as a "hodgepodge" of contextual factors rather than as a specific problem that can be solved in a linear fashion (Miller & Malcom, 1990). The first, and often most difficult step is sorting out and prioritizing variables to determine if a problem even exists. An example is a nurse differentiating a potentially life-threatening arrhythmia from artifact on telemetry. To engage in the process of critical thinking is to search for what is behind, or what comes before what appears to be the

real problem (Harbison, 1991). Unstated, hidden, or suppressed premises, propositions or assertions of fact or belief may be the real problem underlying the obvious symptomatic manifestations that cry for attention (Mechanic, 1991). Problem misidentification can lead to wrong decisions and no solutions.

Some guidelines for critical thinking to help to define a problem more accurately are as follows. A problem definition should not be too general or too vague or too specific as it effectively restricts alternative solutions (Moore, McCann and McCann, 1985; 6-10). It is important to avoid a definition that itself is identified as a solution to the problem. One should also not rule out missing, unstated or suppressed premises that are better candidates for the problem statement than the actual problem definition (Moore et al, 1985). This is known as the "fallacy of slothful induction" also called the fallacy of an a priori assumption, or the use of self-sealers (Bandman et al, 1990). One who commits this fallacy refuses to allow evidence to be considered that contradicts a previous conclusion. Assumptions are statements that are taken for granted without question. Assumptions can be hidden, implied or ignored, but operate in a powerful manner.

By engaging in the process of critical thinking, hidden assumptions

are converted into explicit assumptions that must be taken into account in reaching a decision. Suppressed or unstated assumptions can be highly influential in leading the uncritical thinker to the wrong conclusion as the basis of a faulty decision (Moore et al, 1985).

Gathering Information

In principle, the more information gathered about a situation, the better the quality of the decisions. In reality, the amount of data available regarding most subjects is often overwhelming (Moore et al, 1985). The challenge becomes one of sorting out and selecting data that are relevant to the investigation leading to a decision. A clear definition of the problem is useful to assist in delineating its boundaries (Mechanic, 1991). Once the primary focus of the problem is defined, information can be gathered that bears directly on its core and disposition. Information and data may come from many areas ie: from experience (either anecdotal or statistical). The requirement for accepting information is that the "data must be accurate, relevant, free of bias, correctly interpreted and well organized (Mechanic, 1991; 80-81).

Possible Conclusions

A common problem that follows the gathering of information is that of deciding what to do with the data and how to use it most effectively. Here,

several tests may be useful. The test of adequacy asks if there is sufficient data upon which to make inferences as the basis for generating possible conclusions (Mechanic, 1991). Any inference may be characterized as a bridge or railroad track that permits movement from one place to another place; to move from a statement, proposition or judgement considered true to another statement, proposition or judgement considered true that follows the former (Bandman et al, 1990).

Another test of information is that of accuracy. Information that is inaccurate, vague or ambiguous is worse than useless as it can lead to an inaccurate conclusion and to a wrong decision (Mechanic, 1991).

Furthermore, a third test of the worth of information is that of relevance. Even though information is accurate, it may simply be irrelevant to the problem at hand. It may even obscure the directness and the clarity or decision making.

Inferences based on data generate tentative conclusions. On the basis of information that is adequate, accurate and relevant, inferences can be made regarding the problem statement. Essentially, the problem solver can begin to generate possible solutions in the process of gathering information (Mendelsohn et al, 1987). The clearer the problem definition and problem statement, the more easily alternatives arise in the process of

collecting data. Moreover, the more alternatives generated and considered, the more meaningful and possibly wiser the solution (Mechanic, 1991).

Testing Conclusions

The objective of this phase is to critically assess the reliability of all possible conclusions. Because conclusions are reached by the process of reasoning, the validity, soundness, and usefulness of arguments used need critical scrutiny as the basis of reliable decisions. The test for the validity of an argument is based on the premises that imply the conclusion (Mechanic, 1991). A valid argument can have true premises and true conclusions or false premises and false conclusions (but not true premises and false conclusions). Therefore the validity of an argument does not guarantee the truth of its conclusion (Mendelsohn et al, 1987). Because decisions in everyday life are expected to be reliable, that is, based on the truth of premises and of conclusions, an argument needs to be sound. The test for an argument that is sound is that it is both valid and based on true premises and true conclusions to be reliable as the basis for decisions.

Evaluating Conclusions

Factors significant to each of the alternative solutions or decisions need consideration from the perspective of consequences, value judgements, beliefs, and policy. Also, prior to implementing the decision,

possible adverse consequences need analysis. They should be weighed in terms of the seriousness and probability of each choice (Mechanic, 1991).

The aim here is to determine what solutions among those tested are workable. The reliability of conclusions tested calls for critical appraisal.

The evidence upon which the premises are based and the conclusion is inferred is subjected to intense scrutiny (Mechanic, 1991). We must consider whether the evidence for the conclusion is true beyond any reasonable doubt. Even if the evidence is highly probable in contrast with evidence with a low probability, we should also "consider whether the conclusion is sufficiently reliable to justify a decision" (Mechanic, 1991; 170). If the evidence is insufficient and the conclusion thus unsound and unreliable, the cycle is repeated.

Another consideration in evaluating conclusions is to consider underlying value assumptions. For example, the spread of acquired immunodeficiency syndrome (AIDS) could be largely contained by testing and isolating carriers and victims of the disease. Such a conclusion, however, denies basic human rights of choice, privacy and confidentiality. It would subject identified victims to stigma, rejection, isolation and possible cruel and unusual punishment. Society could become dichotomous and irreparably split into the haves and the have-nots of AIDS and its related

conditions.

Reaching Decisions

After critical appraisal of each of these phases of the cycle, the decision is seemingly an obvious inevitable sequela of the process. Such a view however, omits consideration of those human characteristics that comprise our individuality. Each person's frame of reference includes an organized body of knowledge, experience and beliefs useful to understand and interpret new experiences (Moore et al, 1985). A serious limitation of our frame of reference is the potential inability to recognize problems (Moore et al, 1985). These limitations most often occur because of lack of knowledge. For example, the nurse without knowledge of the significance of blood gases and other blood chemistry values would be severely handicapped in learning to care for patients in cardiac intensive care unit as signs and symptoms would be meaningless. In essence, "knowledge is necessary to acquire knowledge" (Moore et al, 1985; 11). Thus, inadequate frames of reference are a distinct handicap in reaching sound decisions. False information is a serious or even a fatal flaw in our ability to think critically and make appropriate decisions. A sound and relevant education is necessary for a healthy, well-developed frame of reference. Nevertheless, even a well-developed frame of reference is immeasurably

enriched by the addition of critical thinking skills.

Thinking critically is relevant to every decision made throughout every day of our lives. To choose one course of action means to eliminate others. Few decisions have only one option, therefore, a preliminary step is to determine all the possibilities. The next step is to organize options so that the choices are mutually exclusive (free from repetition) and exhaustive (containing all possibilities) (Giere, 1991). Ranking the possible outcomes according one's own scale of values is useful in making decisions that must also consider the state of the world resulting in outcomes that are ranked according to the decision maker's values.

Giere (1991; 280-282) defines three categories of decision strategies as dependent on the availability of information. The first category is that in which the "...evidence for a particular state of the world is so good that the chance of being wrong is small" (Giere, 1991; 284). He calls this "decision making with certainty". Predictably, when nothing is known about the occurrence of the state of the world, that category is called "decision making with uncertainty" (Giere, 1991; 285). The middle case is knowing the probability of each state's occurrence. This information may be statistical and Giere calls this category "decision making with risk". It is important to remember that an inductive form of scientific argument is never

absolute truth, because the possibility of reaching a false conclusion from true premises is ever present (Giere, 290). Moreover, some premises thought to be true may turn out to be false.

Thus, actions and states of the world can be independent. Much of nursing practice, however, occurs in a context in which actions and states are not independent. A professional quality of nursing care, for example, usually evokes more nursing needs from a patient than were originally perceived by either nurse or patient. Critical thinking about each phase and dimension of decision making helps in arriving at decisions that are valid, sound and useful.

Critical Thinking in Education

Education plays an important role in the discipline of nursing, and facilitating critical thinking in the educational process is very significant. Siegel (1988) discusses the role of critical thinking in education and believes critical thinking to be an educational ideal. He views the important issue not to be the question of whether or not there is a generalized skill of critical thinking, but rather inquiry surrounding the ways critical thinking manifests itself. Siegel takes the position that critical thinking is both "subject specific...and general". I concur with this view and argue for it here.

Siegel (1988) identified three imperatives for teaching critical thinking. First, to teach critical thinking is to facilitate students' self-sufficiency and autonomy, to help students to "act and judge on the basis of a reasoned appraisal of the matter at hand" (Seigel, 1988; 69). This is incompatible with any educational program that aims to prepare students for a preconceived slot or role without any active participation in those arrangements. To treat students with respect means to recognize their rights to use independent judgements and evaluation on the basis of honest reasons and explanations that are questioned, challenged and justified (Siegel, 1988; 71).

Siegel's (1988, 81) second imperative for teaching critical thinking is to "empower the student to control his or her own destiny...to encourage them to ask questions, to look for evidence, to seek and scrutinize alternatives, and to be critical of their own ideas as well as those of others". Such persons are liberated because they are free of the control of unjustified beliefs and attitudes that cannot be supported; such persons can take charge of their own lives.

Lastly, Siegel's third imperative for supporting critical thinking as an ideal is to promote rationality as the use of reasons. A scientific researcher identifies and selects "what counts as good reason for or against some

hypothesis, theory or procedure" (Siegel, 1988; 80), how much weight to give it, and how to appraise it in terms of other reasons that may seem relevant. The researcher works within the tradition of science that holds to standards and principles that are evolving, but that are impartial and universal in application, for the appraisal of reasons.

Three models exist to help orient the teaching and learning of critical thinking in nursing (Scheffler, 1985; 80). Adapted from the context of teaching, they are the Feeling model, the Vision model, and the Examination model. The feeling model emphasizes feelings, impressions, and data: the given. Feelings call for observation, sensitivity, care, concern, alertness for vital signs, symptoms and clues, and attention to a patient's state of mind (Scheffler, 1985). The feeling model included "hands-on" nursing. But feeling is not enough. We also need ideas, vision and insight into those feelings, impressions and data.

The vision model is used to generate a pattern of thought, to organize and interpret feelings, to assemble a patient's data, and to formulate a hypothesis, an inference, a guess, an idea about a patient's health care problem (Scheffler, 1985). To engage in critical thinking is to search for insightful principles and rules that may guide appropriate responses to the expressions of both the nurses' and the patient's feelings.

But even the best hypotheses can be wrong. There is a need to test the ideas and hypotheses a nurse formulates. Consequently, the examination model is used to reflect on ideas, insights and visions (Scheffler, 1985). Nurses examine their ideas with the help of relevant criteria, referred to by philosopher L. Wittgenstein (1891-1952) as "outer criteria". According to Wittgenstein (1952; 153) "an inner process is in need of an outer criteria". Nurses use the examination model to search for appropriate rules of inference, investigation, testing, inspecting, verification, confirmation, corroboration and justification. These models provide a framework for teaching students how to think critically. Skills, habits, ability and attitudes are all involved in critical thinking and the appropriate use of these models.

Thus, the role of critical thinking in nursing education means movement from freedom of expression to an enriched freedom of reasoned restraints. Critical thinking in nursing consists in sharpening the distinctions between certainty, near certainty and degrees of uncertainty. A nurse learns to discriminate by understanding and observing appropriate criteria.

Ennis (1992) believes that perhaps the most controversial issue within the critical thinking movement today is whether critical thinking should be taught separately (the "general" approach), be infused in

instruction in existing subject-matter areas (the "infusion" approach), result in a student's immersion in the subject matter (the "immersion" approach), or be taught as a combination of the general approach with infusion or immersion (a "mixed model" approach). In addition to the political, economic and administrative aspects of the basic issue, one unresolved theoretical aspect is whether critical thinking is subject specific; that is, specific to subjects.

The General Approach

Ennis (1992) describes the general approach as an approach that attempts to teach critical thinking abilities and dispositions separately from the presentation of the content of the existing subject matter. Examples of the general approach usually involve content such as political issues, and the primary purpose is to teach students to think critically, using non-school subject contexts. The concept of the general approach, however, does not necessarily require content. For example, logic instruction can be formulated in terms of relationships between variables. In this approach, the balance between emphasis on principles that are applied to content and emphasis on abstract principles depends on the nature of the content, the critical thinking dispositions and abilities being promoted. General critical thinking instruction could take place in separate courses such as an informal

logic course in college, or as a separate thread in an existing subject-matter sequence. Examples of authors who cite the general approach are Kruse & Presseisen (1987), Nickerson, Perkins & Smith (1985) and Sternberg & Kastoer (1986).

The Infusion Approach

Ennis describes the infusion approach as an approach that attempts to teach critical thinking in deep, thoughtful, well-understood subject matter. The student is encouraged to think critically in the subject in which he has a deep understanding, and also, the general principles of critical thinking dispositions and abilities are made explicit. By explicitly developing critical thinking abilities in the process of acquiring the knowledge and skills necessary in a domain, the objectives of education and training can be met (Glaser, 1984). Proponents of the infusion approach include Glaser (1984, 1985), Resnick (1987) and Schwartz (1987).

The Immersion Approach

The immersion approach is described by Ennis (1992) as a similar approach that attempts to teach critical thinking in well-understood subject matter. However, unlike the infusion approach, the general principles of critical thinking dispositions and abilities are not made explicit, and the focus is on a deep understanding of the subject area only. Rather, the

principles of critical thinking are implicit in the subject matter. Advocates of the immersion approach include McPeck (1981).

The Mixed Approach

The mixed approach consists of a combination of the general approach with either the infusion or the immersion approaches. There is a separate thread or course aimed at teaching general principles of critical thinking, but students are also involved in subject-specific critical thinking instruction. Supporters of the mixed approach include Ennis (1987), Sternberg (1987), Nickerson (1988) and Perkins & Soloman (1989).

Domain Specificity

The author has selected the infusion approach in the development of the curriculum in Infection Control. Since critical thinking cannot exist in a vacuum, it must be contextually driven, thus the instruction in critical thinking skills must be directed towards some specific subject area.

According to Ennis (1989), domain specificity is characterized by three principles:

1. **Background knowledge** is essential for thinking in a given domain
2. **Transfer** i) simple transfer of critical thinking dispositions and abilities from one domain to another is unlikely. However, ii) transfer becomes likely if a) there is sufficient practice in a variety of

domains, and b) there is instruction that focuses on transfer

3. **General instruction** it is unlikely that any general critical thinking instruction will be effective (Ennis, 1992)

Most cognitive scientists believe in at least the first two principles. All three principles together constitute what Ennis (1992) calls "strong domain specificity" that would support the infusion only approach to teaching critical thinking.

Domain Specificity Principle 1

Background knowledge is essential for thinking in a given domain

A number of studies including several cited by Glaser (1984) substantiate the claim that knowledge about a subject is ordinarily a necessary condition for thinking critically. However, it would be dangerous to infer carelessly from this that subject-matter knowledge is a sufficient condition for good thinking. First, a person experienced in a subject area may stop thinking, become inflexible, and perhaps become unable to conceive of and consider alternatives. Second, subject-matter knowledge often consists of a mass of rote memorized data that is not understood deeply enough to enable critical thinking. Lastly, if the domain specificity principle is correct, immersion in a subject matter area will probably not lead to critical thinking in everyday life, since immersion is not accompanied by

explicit attention to general principles of critical thinking.

Domain Specificity Principle 2

- i) Simple transfer of critical thinking dispositions and abilities from one domain to another domain is unlikely.***
- ii) Transfer become likely if:***
 - a) there is sufficient practice in a variety of domains, and***
 - b) there is instruction that focuses on transfer***

The application of parts i) and iia) requires the ability to distinguish domains. Carey (1985; 487) characterized a domain as "encompassing a certain set of real-world phenomena, a set of concepts used to represent those phenomena and the laws and other explanatory mechanisms that constitutes an understanding of the domain". This broad definition allows application of the transfer principle in making predictions about whether learning in the last area will then be applied in the others. However, the definition does not explain whether topics are in different domains from one another.

There needs to be more exploratory research similar to Linn et al's study, (1981) that investigated the extent to which each of many aspects of critical thinking, when taught to various kinds of students in the context of single pieces or various combinations of pieces of subject matter, was likely to be successfully applied to some other particular piece of subject matter. Until more research is done, parts i) and iia) of the transfer principle

tend to sound slogan-like. The concept domain is too vague to generate predictions about whether critical thinking abilities and dispositions, taught and applied in one situation, will be able to be applied in another situation without special transfer instruction.

Domain Specificity Principle 3

It is unlikely that any general critical thinking instruction will be effective

The summaries that have been done to date show mixed results. On the basis of the literature, Glaser (1984; 93) is pessimistic about the possibilities of teaching "the abilities to think and reason...as subsequent add-ons to what we have learned", as are Resnick (1987) and many others. On the other hand, Holland et al (1986), Langley, Simon, Bradshaw & Zytkow (1987) and others are somewhat optimistic and have concluded that some general programs are helpful.

However, even the most optimistic reviewers express reservations about this overall conclusion because of the difficulties in evaluating the results of programs that have been studied. The difficulties include uncertain validity of evaluation devices, vagaries of experimental design, lack of objective information and differences in conceptual systems and jargon. Despite all this, many make the guarded claim that some general thinking programs, including at least some critical thinking were helpful

(Ennis, 1992).

In summary, domain specificity illustrates the importance of deliberate teaching for transfer combined with frequent application of principles in many different areas, and warns that a critical thinking aspect demonstrated in one situation will not necessarily be applied to another.

Critical Thinking Exemplified

By examining the work of nurses in various situations from a multidimensional perspective, Benner (1984) has provided insight into the knowledge embedded in the clinical practice of nursing. Her work on novice versus expert nurses can provide a potential base for assessing the critical thinking processes used by nurses as they manage patient care situations.

Benner was the first nurse researcher to report using paradigm cases to study nurses' lived experience in clinical practice. She describes a paradigm case as a narrative description of a past instance of clinical practice that stand out in a nurse's memory (Benner, 1984). Benner utilized this narrative research to discover the progression of how a nurse proceeds from one stage of skill acquisition to another within and among nursing domains. In addition, Benner applied Dreyfus and Dreyfus' (1980) levels of skill acquisition to the nursing profession. Five levels of proficiency were identified including novice, advanced beginner, competent, proficient

and expert. To progress through the levels, Benner (1984; 13) concluded that the nurse needs to attain and enhance the following three general aspects of skilled performance:

- a) the ability to use past concrete experiences as paradigms,
- b) an ability to see a situation as holistic in which only certain pieces of information are relevant, and
- c) the ability to become an involved performer in the situation

These three general aspects are all closely related to the definitions of critical thinking and the necessary attributes for the critical thinker. When the practitioner reaches the expert level, these aspects become so ingrained that they are considered intuitive (Benner, 1984). Knowledge of critical thinking provides a foundation for development of expertise in any discipline within nursing including infection control. Nurses who have a broad base of clinical experience and are striving for self improvement should have this type of knowledge. The ability to think critically for nursing develops with increased focus on critical thinking processes, subject specificity, and experience in application of these processes to decision making.

Description, validation and evaluation of these processes by self and others develop awareness and ability that will be useful for future decision making (Benner, 1984).

Benner identifies the use of flexible and situation-dependent problem solving as skills that discriminate between competent and expert practice. The integration of analytic and logical problem-solving skills facilitates the expert's practice and is reflected in automatic and reflective clinical behaviours. The expert is able to move smoothly through clinical procedures giving attention to the most salient aspects of the situation at hand.

The Novice

In the novice stage, the beginner has little or no experience in the situation in which he/she is expected to perform. To give them entry to these situations and allow them to gain the experience necessary for skill development, they are taught "context-free" rules ie: a fixed set of actions without comprehending the individual client's responses. "These are features of the task world that can be recognized without situational experience" (Benner, 1984 p 21). The rule-governed behaviour typical of the novice is limited and inflexible, but since they have no experience of the situation they face, they must be given rules to guide their performance. Thus, the novice lacks discretionary judgement and cannot independently determine what is and is not significant. The novice requires assurance if there is a deviation from the normal sequence of events. Benner stresses

that interpretation does not occur at this level, nor does critical thinking.

The Advanced Beginner

The advanced beginner (or new graduate) is one who has coped with enough "real" situations to identify the recurring meaningful components, which Dreyfus termed "aspects of the situation". Benner explains that "aspects" include overall general components which can only be identified through prior experience. By recognizing the "aspects of a situations", the advanced beginner is less dependent on "context-free" rules or the procedural list of things to do, and can actually adapt the procedures to specific patient situations. Thus, advanced beginners progress from the rule-bound behaviours of completing tasks by prescribed times and begin to adjust to patient needs. Even though the advanced beginner can formulate guidelines based on experiences with situational aspects and attributes, "he or she tends to ignore their differential importance, thereby treating them equally" (Benner, 1984; 17).

Advanced beginners still did not know how long tasks took and were unable to predict what problems might occur and what solutions were possible (Logan, 1993). This explains the beginner's lack of organizational skills, for it is difficult to organize the whole when individual tasks take much longer than planned, or when something unforeseen occurs. The

learner recognizes the complexity of the situation but is unable to judge or prioritize the different aspects.

Competent Practitioner

Changes that mark the transition to the competent stage include the ability to plan care for an entire day, to begin to set long-term goals, and the ability to view the patient holistically. This focus on the long-range allows the competent practitioner to judge the relative importance of all aspects of the situation. Hence "a plan establishes a perspective, and the plan is based on considerable conscious, abstract, analytic contemplation of the problem" (Benner, 1984; 18). The competent nurse has a feeling of mastery and the ability to cope with and manage the many eventualities of clinical nursing. Organization and efficiency improve as a result of the conscious and deliberate planning of the competent practitioner. However, the nurse at this stage still requires assistance if the original plan of care fails, and they still lack speed and flexibility.

Proficient Practitioner

As nurses enter the proficient stage of skills acquisition, they demonstrate improved decision-making, and a holistic understanding of situations as a result of continued practice and experience. "The proficient performer perceives situations as wholes, rather than in terms of aspects,

and performance is guided by maxims (Benner, 1984; 27). In 1958, Polanyi described maxims as the "cryptic instructions which experts pass on" (Benner, 1984) that make sense only if the person already has developed a deep understanding of the situation. Furthermore, maxims reflect what would appear to the competent and novice practitioner as "unintelligible nuances of the situation" (Benner, 1984; 16). Thus, by the proficient stage, the nurse has learned from experience. Typical events are expected and the plan of care can be modified accordingly if the normal picture does not materialize. The proficient nurse questions and challenges, develops individual heuristics, and is now frustrated by those context-free rules which guided earlier practice.

Expert

By the expert stage, the practitioner has an intuitive understanding of the situation, and focuses on the critical elements. The expert nurse no longer relies on analytic principles (heuristics, rules, guidelines, maxims) to connect his/her understanding of the situation to an appropriate action.

Benner (1984; 32) describes that the expert nurse

with an enormous background of experience, zeroes in on the accurate region of the problem without wasteful consideration of a large range of unfruitful, alternative diagnoses and solutions...the expert operated from a deep understanding of the total situation.

Experts are noted particularly for their intuitive diagnostic and monitoring skills which result in excellent case management, and for their ability to function during emergencies and in novel situations. Corcoran-Perry & Bungert (1992; 65) also agree that intuitive processes involve more than cognition; "they also involve attitudes, values and a sensory grasp of the whole within a particular context". Benner's conclusions also coincide with research findings by Perkins and Solomon (1989) on the games of grand master chess players. Their tactics depend on an enormous knowledge base of important pieces, with a "diversity and complexity not recognized by the chess masters themselves...expert chess players reasoned about the game using chunk-like configurations, rather than thinking about one piece at a time" (Perkins & Salomon, 1989; 18). The results show that grand masters know something very powerful, but very specific to chess. Dreyfus also describes the expert performer in a similar way (Benner, 1984; 19):

the performer is no longer aware of features and rules, and the performance becomes fluid and flexible and highly proficient. The chess player develops a feel for the game, the language learner becomes fluent, and the pilot stops feeling he is flying the plane and simply feels that he is flying

The premise that efficiency in clustering information develops with experience in a given setting with specific patient presentations is also supported by the research of White, Nativio, Kobert and Engberg (1992),

Kassirer and Gorry (1988) and Tanner, Padrick, Westfall and Putzier (1987). Perkins et al (1989) also suggest that expert performance entails a large knowledge base of domain specific patterns, rapid recognition of situations where these patterns apply and reasoning that moves from such recognition directly towards a solution by working with the patterns, called "forward thinking". Perkins et al (1989) continues to explain that this expert way of thinking, from the known to the unknown, is opposite to the thinking of a novice, termed "backward reasoning". Novices tend to see relevant patterns, and they solve problems by focusing on the unknown first, and then move to the known (Perkins et al, 1989).

Benner's work suggests that critical thinking in the discipline of nursing is content-dependent and experiential. Generic critical thinking skills are of little value until the practitioner has ample real-life clinical experience and knows when to use these cognitive and emotional skills. Corcoran-Perry also proposes that critical thinking is content-bound: "clinicians use a wide range of analytical and intuitive processes to make decisions and these processes are task-dependent" (Corcoran-Perry, 1992; 64).

Furthermore, Perkins et al (1989; 19) discusses the issue of transfer of general critical thinking skills and concludes that "thinking at its most effective depends on specific, context-bound skills and units of knowledge

that have little application in other domains".

Holbert and Abraham (1988; 24) point out that critical thinking is a knowledge-dependent activity, concluding that "knowledge and thinking ability are interdependent and mutually reinforcing: attempting to develop one without the other is like trying to make cloth with only one side".

Nickerson, Perkins and Smith (1985) also argue that students need explicit instruction in generic critical thinking and problem-solving as well as the application of these skills in specific content domains. After all, critical thinking can never be context-free; "it does not take place at a level of abstraction absolutely remote from the workaday world" (McKenzie, 1992; 5). Thinking is always influenced by the context of the thinker (Dufault, 1990). These points mutually emphasize a belief that critical thinking is subject specific, and that generic critical thinking skills cannot be transferred. Furthermore, they support the infusion method of teaching critical thinking skills endorsed by Ennis.

A research study conducted by Brooks and Shepherd (1990) was undertaken to investigate the relationship between clinical decision-making skills in nursing and critical thinking abilities of senior nursing students. Clinical decision making was measured by the Nursing Performance Simulation Instrument, and general critical thinking abilities were determined

by the Watson-Glaser Critical Thinking Appraisal. This study proved a "significant positive relationship between critical thinking and decision-making" (Brooks et al, 1990; 396). The results showed that while the critical thinking scores of the university students were higher than diploma students, the clinical decision-making scores were identical. Thus, it does not appear that a higher level of inherent generic critical thinking ability transfers to the more specific decision-making skills in nursing (Brooks et al, 1990).

In conclusion, critical thinking and its components of problem solving and decision making are becoming increasingly important in nursing, especially within the discipline of infection control. By examining the Dreyfus model of skill acquisition and Benner's narrative research with nurses, it is evident that expertise requires domain specific knowledge and decision making skills. The proposed infection control educational program will facilitate the development of these vital critical thinking skills via the infusion process endorsed by Ennis, where explicit critical thinking skills are learned with particular emphasis on subject specific knowledge.

TEACHING-LEARNING METHODS

Learning

The next area to be considered when developing a curriculum philosophy based on critical thinking is the various teaching and learning methods used. The essential methodology used in the infection control educational program will include principles of adult learning, self-directed learning, discussion and problem-based learning. These techniques promote and facilitate the dispositions and abilities reflected in critical thinking.

One area in higher education which has received considerable attention is the implementation and development of strategies to promote "lifelong learning". Descriptions of the personnel, processes, methods and materials, instruction, administrative and organizational conditions necessary for its facilitation have been provided (Knapper and Cropley, 1985).

According to Cranton (1989), the approach to lifelong learning should be adopted as the guiding principle for reforming education at all levels and in all countries. Many factors have contributed to the interest in the promotion and importance of lifelong learning including social, economic and cultural. However, the growth of the phenomenon of change in our contemporary society has probably been the strongest catalyst for the trend of lifelong

learning (Norman, 1988). The relationship between education and change has been described by McClusky (1974; 101) who points out that "continuous change requires continuous learning". There are many implications of change in the discipline of education. Three specific implications which will be discussed include the use of an integrative approach of adult learning in a discipline, the implementation of problem-based learning and the approach of self-directed learning.

It is evident that since the information which is available to students in any field grows exponentially, "the ability to integrate and maintain an overall perspective becomes critically important; perhaps even more important than mastery of specialized technical expertise" (Knapper et al, 1985; 58). Also, because learning is a life-long process, it is more important for nurses to be taught how to think rather than what to think (Jones et al, 1993).

Adult Learning

The issue of adult learning and the characteristics of adult learners has been the subject of lively discussion for many years. In developing a curriculum based on critical thinking principles, it is essential to include a philosophy of adult learning. The Canadian Association of Adult Education (1982) has called for greater attention to be paid to the development of

teaching methods which are more appropriate for mature students.

Malcolm Knowles has developed a comprehensive "andragogical" (literally "the art and science of helping adults learn") model to aid in the education of adults (1970, 1975, 1978, 1984). The inherent assumptions of this model (Appendix 2 and 3) are contrasted with those of the pedagogical model:

(1) The concept of the learner:

Within the framework of the pedagogical model, the teacher has full responsibility for making all decisions about what should be learned and whether it has been learned. In contrast, within the androgogical model, the self concept of the learner moves from being a dependent personality toward one of being a self-directing human being. Adults develop a "deep psychological need to be perceived by others, and treated by others, as capable of taking responsibility for ourselves" (Knowles, 1984; 9). Indeed, adult learners may be faced with an internal conflict that results from a conditioned expectation of school and education which contrasts with their deeper psychological need to be self-directing.

(2) The role of the learner's experience:

The pedagogical model assumes that learners enter into an educational activity having little personal experience that can be used as a

valuable resource for learning. It is the experience of the teacher, the textbook writer and the audiovisual aid producer that matters. Hence, the pedagogical methodology is one of transmission techniques. The androgical model assumes that adults enter into an educational activity with both a greater depth and breadth of experience than that of the child. Consequently, the teaching techniques employed should utilize this experience and an emphasis should be placed on such techniques as group discussion, simulation exercises, clinical experience and problem-solving projects, which allow the adult learner to share and build on their own personal body of knowledge.

(3) Readiness to learn:

In the pedagogical model, readiness to learn is simply a function of age, and students become ready to learn only what they are told they are ready to learn. On the contrary, adults are ready to learn when they experience a need to know or do something in order to perform more effectively in some aspect of their lives. Such "needs" do not necessarily develop intuitively, but rather may be fostered within the learner by the educator through the use of skills inventories, needs assessments etc.

(4) Orientation to learning:

According to the pedagogical model, the orientation into which

students enter into an educational activity is subject-oriented. Therefore, the curriculum is organized according to content units and is sequenced according to the logic of the subject matter. Given that adults, on the other hand, enter into an educational activity with a life-centred, task-centred or problem-centred orientation to learning, it is important to make clear the relevance of the material and to organize the learning experience around life situations rather than according to subject matter units. Moreover adults usually bring more clearly developed personal goals and better formulated ideas about what constitutes useful information to the learning situation.

(5) Motivation to learn:

In contrast to the pedagogical model within which students are motivated primarily by external pressures (ie: teachers, parents and grades), the androgical model predicts that internal motivators (ie: self-esteem, recognition and self-confidence) are more powerful motivators.

In addition, research on adult education (Norman & Schmidt, 1992, Knowles, 1988, Zemke, 1988) indicates that using a single theory to develop strategies, methods or procedures may be restrictive and in conflict with currently known adult teaching-learning principles. Some of the principles which apply to teaching strategies summarized from Zemke (1988) are as follows:

- training must be received as early as possible following a life-change event such as volunteering for the liaison program
- new ideas should be integrated with what adults already know (active learner participating)
- avoid fast-paced, complex or unusual learning tasks (transition time is needed)
- present one concept at a time
- summarize frequently
- self-directed learning with resources provided is preferred
content with how-to instructions is preferred

In addition to these, a variety of methods should be utilized to meet the needs of various learning styles (Ault, 1986; Robinson & Grey, 1974; and Kolb, 1976). These teaching-learning methods are used by an educator to facilitate an interaction that will assist the learner to achieve a specific learning need.

The characteristics of adult learners and the significance these have in teaching and learning styles have been applied to the curriculum of the Infection Control Liaison program. Each of Knowles' assumptions has been considered. Although the learners do not have complete control over what is to be learned, there is enough flexibility afforded by the curriculum that

the learners can focus on specific aspects of the problem that are of interest. With respect to the role of the learners' experience, Knowles (1970) has suggested teaching techniques such as group discussions, case study, role playing and clinical experience. "There is a distinct shift in androgogy away from the transmittal techniques so prevalent in youth education...toward the more participatory techniques" (Knowles, 1970; 45).

Self Directed Learning

The self-directed approach to adult learning enables the educator to overcome some of the obstacles raised by the learner. The acknowledgement that learners learn in response to their own needs, and not those of the teacher is allowed when implementing self-directed learning (Norman, 1988). Allowing the adult to assess his own needs is facilitated by the self-directed method and Norman (1988; 280) believes that this "needs assessment is the first step in preparing an effective adult learning experience". The interest of the learner must be captured in order for learning to occur. The only way to ensure that all individuals are interested is to allow them to express their interest through self-direction. Free will of adults must be expressed in order to maintain interest and satisfy egotism (Knowles, 1970).

The typical adult has evolved a particular outlook and perception of the environment, and as such, it is not surprising that all experiences are perceived with a particular focus. This means that each learner perceives a learning experience in a different way than other learners or the teacher. In addition to differences in perception, the teacher and learners each have their own definition or interpretation of the learning goals. This difference in goals does not pose problems when using self-directed learning methodology. The implication of self-directed learning however, is that the teacher must recognize these differences and allow learning to occur in relation to each individual goal.

Another adult characteristic that coincides with self-directed learning is that of self-responsibility and self-reflection. Adults are capable of internalizing the responsibility of teaching themselves, as well as conceptualizing their own learning process; they rely on themselves for reflection and direction of their individual learning processes. This self-direction and reflection, as well as self-concept, enable adults to set their own learning objectives and learning pace. It is this ability to be self-directed that relatively and logically links self-directed learning with the self-directed adult.

In order to establish a self-directed learning process, certain

conditions must exist. First, the learning atmosphere, content and context must be non-threatening to the individual. Any threats will hamper the adult's ability to concentrate and will force the learner to focus on defending himself from threats. Second, the content of material involved in the learning process must contain some personal relevance to each individual. The ability to use relevant material or subject matter enables the learner to apply what is being learner to his own experiences and situations. Relevancy will play a role in maintaining the learner's interest. Presentation of this relevant material must be made using varied approaches, and directed towards different sensory modes. This is important not only to maintain the learner's interest, but it enables the teacher to maximize input, and appeal to different modes of perception for a variable effect. The last condition that must be met in order to establish a self-directed learning process concerns communication. Communication must be two-directional between teacher and learner with considerations to allow the learner to talk and self-reflect, and the teacher to listen and self-reflect (Brundage, 1980). Only when these conditions are met can the self-directed learning process produce effective results or learning.

However self-directed the mode of instruction, the role of the instructor remains important. Knapper et al (1985; 147) explains that

"self-directed learning does not mean that the individual always learns by himself, but that he is able to seek and to use others to explore, reinforce and validate learning". Indeed from the theoretical base of androgogy there emerge characteristics of adult learners which have great significance for educators who see themselves as "resources for self-directed learners" as opposed to "imparters of knowledge" (Knowles, 1970). In accordance with Knowles' (Knowles, 1970; 43) androgogical model, the role of the teacher is redefined as that of

a procedural technician, resources person, and co-inquirer; he is more of a catalyst than an instructor, more a guide than a wizard...andragogy assumes that a teacher can't really 'teach' in the sense of 'make someone learn', but that one person can only help another person learn.

In self-directed learning, the role of the instructor is primarily to give support and guidance, and help provide a framework for discovery. The instructor will initiate and encourage dialogue that will involve all members of the class as opposed to merely telling the students the correct answer (Knapper et al, 1985; 119). In student-centred discussion, the active, participatory role of the instructor diminishes with an increase in the time spent by students discussing the issues and problems. Questions and comments are directed to other students more than to the instructor. The instructor's role is to pose key questions, present dilemmas and paradoxes,

and foster insight (Norman, 1988). The responsibility of the discussion is turned over to the learner and as a result, the students become more directive and play an active role in their own learning.

It is the ability of the self-directed learning approach to teach the individual how to teach himself that is the most valuable quality of this learning method. Conventional methods have taught the student particular subjects and information. Whether the student in such circumstances actually learns the material is questionable. The attainment of knowledge is only part of the learning process. McKeachie (1988; 168) reinforces the multivariant purpose of teaching when he states:

there are many important goals of ...teaching; not the least of these is that of increasing the student's motivation and ability to continue learning after leaving [the formal learning atmosphere].

Thus the goals of teaching can be as diverse as the goals of each individual learner. The self-directed learning process addresses and achieves both the teaching and learning goals through its focus on the individual, his past experiences, motivation and desire for respect. It is the individual focus that enables the learner to teach himself. As Brundage states: "in the end, it is the individual who learns" (Brundage & Mackeracher, 1980; 1).

Discussion

Discussion is considered particularly useful as a learner-oriented

method. Educators have long been aware of the beneficial effects that the presence of other learners imparts on the performance and thinking of a learner (Allport, 1990). Adult educators found that their more conventional techniques were not altogether satisfactory for teaching mature students since such learners exhibited strong resistance to instruction presented as dogma without opportunity for discussion and rebuttal. When provided with the opportunity to participate in the educational process, the motivation of most adult learners was very high (Olmstead, 1988; 79).

The recognition of the value of active participation of students led many adult educators to the use of small group discussion as an important vehicle for learning. It was found that "well conducted discussions of relevant problems and issues satisfy the adults' needs for active learning, and are better for overcoming resistance to new ideas" (Olmstead, 1988; 80).

In the context of discussion as an educational tool, "discussion" takes on a more precise meaning than it does in general usage. In the educational sense, discussion is a "calculated and systematic attempt to apply knowledge, thought and fact-finding to solution of a problem, or resolution of an issue so that learning may occur" (Olmstead, 1988; 81). Thus, the kind of discussion around which small group discussion is built in

an educational setting has been defined as "group deliberation" carried on through oral discourse, aiming at the cooperative solution of a problem or resolution of an issue through reflective thinking.

While there have been few studies on the connection between discussion and learning, those that have been conducted confirm that discussion can lead to a number of desirable outcomes including: increased curiosity about the subject area, more positive perceptions about the value of the subject; higher ratings of the course, increased time spent reading material related to the subject; and higher attendance at course sessions (Shamian & Lemieux, 1984). Small group discussion is an excellent medium to fulfil a number of objectives including promotion of the understanding of a body of knowledge and the associated relational thinking, elucidation of students' misunderstandings and difficulties, the application of principles to familiar and unfamiliar situations, the exploration of personal and professional attitudes and values, and as a two-way exchange of information on the teaching-learning process (Connelly, Dukacz & Quinlan, 1980; Megenity, 1982; Cranton, 1989). Discussion is also advantageous as it is responsive to the needs of the student (Cranton, 1989). A small group discussion is an ideal setting for a learner to compare his concept of a topic with that of another student. The learner also has the

opportunity to respond to other's needs and share information. "This interaction among students presents the group with a variety of perspectives, opinions and options; a condition which can lead to the students' personal development" (Cranton, 1989; 54).

Discussion seems appropriate for the application of concepts and acquisition of problem-solving skills. The problem-solving techniques of individual members can be shared, and perhaps used by other members of the group. It is also possible to facilitate the development of critical thinking skills among learners since multiple viewpoints and alternative ideas are considered in these peer-to-peer interactions.

Finally, while it has been argued that time spent in discussion may tend to be less productive, it can also be an important process if the goals for the course are the acquisition of interpersonal skills (Cranton, 1989). This is the situation with the infection control liaison program; in addition to the ability to gain knowledge, use knowledge and problem-solve, another goal of the program is the development of communication and interpersonal skills.

Problem-Based Learning (PBL)

According to Albanese and Mitchell (1993), PBL at its most fundamental level is an instructional method characterized by the use of

patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical sciences. This methodology is especially important in the discipline of nursing because of the clinical nature of the role. It is essential to utilize a learning technique that enhances transfer of knowledge to clinical skills and abilities. Barrows (1985; 15) claims that

"the basic outline of the PBL process is : encountering the problem first, problem solving with clinical reasoning skills and identifying learning needs in an interactive process, self study, applying newly gained knowledge to the problem, and summarizing what has been learned".

In the closed-loop or reiterative form of PBL described by Barrows, the PBL process concludes with students' evaluating the information resources used and analysing how they might have better managed the patient problem.

Wilkerson & Felletti (1989; 53) state that it is crucial to PBL that

the problem raise compelling issues for new learning and that students have an opportunity to become actively involved in the discussion of these issues with appropriate feedback and corrective assistance from faculty members

According to Schmidt (1983) there are seven steps involved in PBL: 1) clarify terms and concepts not readily comprehensible, 2) define the problem, 3) analyze the problem, 4) draw a systematic inventory of the explanations inferred from step # 3, 5) formulate learning objectives, 6) collect additional information outside the group, and 7) synthesize and test

the newly acquired information. Furthermore, Norman and Schmidt (1992) reviewed the literature on the psychological basis of PBL and found some preliminary evidence suggesting that problem-based curricula may enhance both transfer of concepts to new problems and integration of basic science concepts into clinical problems. Problem-based learning is an effective methodology for facilitating the Infection Control education program because the seven steps involved in PBL closely parallel the critical thinking process. The inference is made that the PBL process facilitates and reinforces critical thinking. Additionally, the small group process facilitate open discussion and critical analysis of the clinical problems. Furthermore, after examination of the literature on PBL, it seems apparent that PBL is an effective vehicle for the infusion mode of teaching critical thinking endorsed by Ennis. By encouraging students to think critically within the subject area, the infusion mode will allow teaching of the abilities and dispositions of the ideal critical thinker (Appendix 4).

CURRICULUM: INFECTION CONTROL LIAISON PROGRAM

Rationale

The proposal for a hospital-based infection prevention and control enhanced nursing role is intended to respond to the increasing risk and costly morbidity associated with nosocomial infections. In 1978, the Senic Study in the United States identified that the rate of nosocomial infections in University Teaching Hospitals was 5% of the 35 million patients admitted. It identified the annual cost, in 1975, as a result of preventable nosocomial infections was 1 million dollars for an average 250 bed hospital. At that time, the study identified that an organized infection control program with surgical wound surveillance and feedback system was effective in reducing the rate of nosocomial infections (Senic, 1978). The ideal program at that time included one qualified infection control practitioner for every 250 beds. In Canada, there are no similar statistics. The Canadian health care system is slower to acknowledge the impact of nosocomial infections (mortality, morbidity, increased length of stay, repeat surgery, long term antibiotics and blocked beds) other than to make an infection control program an accreditation requirement.

Traditionally, the infection control practitioner defined prevention

interventions, taught them, and monitored their implementation. In today's world, the risks for acquiring infections and the methods to reduce or prevent them are much more complex and involve knowledge of the individual clients' health in each particular situation. The enhanced professional role of the nurse assumes the presence of skills in risk assessment and risk reduction for any adverse events while under the care of the health care system.

The proposed infection control nursing liaison program involves nurses in a university teaching hospital. The program consists of 28 hours of concentrated teaching over 3 months. The actual in-class learning experience will be enhanced with constant self-directed learning and a closely linked communication/ mentorship with the infection control practitioner and associated nurse educators. The in-class concepts and content will be reinforced with application in the clinical practicum to facilitate and promote the transfer of critical thinking abilities related to infection control practice. The role can be defined as the internal ward expert on infection control issues, and the liaison will facilitate all decisions and interventions related to infection control at the ward level consistent with the level of expertise (Appendix 5).

The hypothesis is that this approach to delivering infection control

expertise and intervention is as effective or better than the traditional approach (using 1 infection control practitioner). This approach has been tried and reported anecdotally (Mathews, 1991) as successful, however, there are no validated studies in the literature to support or disclaim this approach.

Curriculum

How does one begin to develop a curriculum? What should be, and should not be included in a curriculum? Lawrence Stenhouse (1981; 4) offers the following definition:

A curriculum is an attempt to communicate the essential principles and features of an educational proposal in such a form that it is open to critical scrutiny and capable of effective translation into practice.

Tyler (1949) identified subject specialists as a primary resource in the process of curriculum development. Whereas, he does acknowledge that some individuals criticize the use of subject specialists for a more generalized program, one must recognize that the ultimate goal of this project is to provide a very "specialized" curriculum in infection control. To meet that goal, several "expert" sources were utilized to develop the content. The College of Nurses (1996) Infection Control Guidelines were used to develop the major subject areas including: (1) transmission of infection (2) preventing the transmission of infection and (3) use of

infection control measures. Furthermore, the Association for Practitioners in Infection Control (APIC) Curriculum for Infection Control Practice (1983 and 1988) was utilized as a subject specific base for developing the curriculum in the following areas:

- epidemiology and statistics
- microbiology
- infectious diseases
- sterilization, disinfection and sanitation
- patient care practices
- education
- management and communication skills
- employee health

In developing a curriculum philosophy based on critical thinking principles, it is essential to include a philosophy of adult learning. Scales (1985; 11) a nursing curriculum theorist, describes a curriculum's philosophy as a "statement of beliefs about the nature of nursing, the learner, the educational process and the ultimate aims of the program". This program offering is not mandatory. Rather, it has been developed to meet the continuing education needs of practising nurses. The desire to increase knowledge of infection control practices, to be more competent in

performing their work/or to be self directed in meeting their own individual learning needs and decision making, are all intrinsic factors, sufficiently motivating the potential learner. In a research project prepared for the Ontario Ministry of Education, Brundage and Mackeracher (1980) identify these motivational factors as sources for increasing self-esteem and self-actualizing tendencies.

Instructional Objectives

Educational objectives are an important tool for learning. They allow the learners to concentrate their resources and effort, and allocate priorities. In the 1930's, Ralph Tyler proposed the practice of specifying the content of instruction in terms of observable student change. Debated, refined and promoted, the use of objectives at all levels of education has become widespread.

The infection control liaison program curriculum requires active participation by the learner. Instructional objectives have been designed using Bloom's Taxonomy of Educational Objectives (Bloom, 1956). The verb at the beginning of the instructional objective informs the learner of the general learning outcome. The specific learning outcomes use action verbs to indicate the intended level of performance or achievement of that objective. Verbs differ depending on the type and complexity of behavioural

outcomes expected of the learner. Bloom's classification is based on a hierarchy that builds from the simple to the complex, and is classified by areas or domains. Each domain reflects a particular set of beliefs and assumptions about how students learn and behave including the: a) cognitive domain b) affective domain and c) psychomotor domain. As previously mentioned, each domain consists of a hierarchy of levels that reflects a range of learner behaviours from simple to complex. Higher level objectives are assumed to include and be dependent on achievement of lower level behaviours and skills.

The cognitive domain (Appendix 6) provides a method of categorizing objectives according to cognitive complexity. It consists of six levels of cognitive complexity ranging from knowledge level (least complex) to the evaluation level (most complex). Each level requires specific learner characteristics and behaviours to meet the objective. The cognitive domain in the infection control curriculum will deal with most of the content issues in the program.

The affective domain (Appendix 7) includes a method of characterizing objectives according to affective complexity. It consists of five levels of affective complexity ranging from receiving (least complex) to characterization level (most complex). As the behaviour required by the

level becomes more complex, more involvement, commitment and reliance on one's self as to what to feel occurs. At the least complex levels, one's feelings, attitudes and values tend to be dictated by outside sources. The range of behaviours is from simple awareness or perception of something, to internalizing a phenomenon so that it becomes part of one's belief system and daily behaviours are in keeping with these values. Higher order affective skills are also congruent with higher levels of competence and reflect increased clinical performance according to Benner.

Similarly, the psychomotor domain (Appendix 8) provides a method for categorizing objectives according to psychomotor ability, and consists of five levels of psychomotor complexity ranging from imitation (lowest level) to naturalization (highest level). These behaviours place primary emphasis on neuromuscular skills involving various degrees of physical dexterity. As the behaviours required to meet the objective becomes more complex, there is a change from gross to fine motor skills. This domain will play a small role within this curriculum, since the emphasis of the infection control program is not on concrete physical skills.

Implementation

The proposed infection control nursing liaison program involves 28 hours of in-class learning consisting of 7 sessions, each 4 hours long. In

considering the program's philosophy, the knowledge and skills of infection control nursing can be considered the "science", while the critical thinking skills, and decision making skills, along with the affective dimension can be considered the "art". Therefore, implementation provides the challenge of facilitating both the art and science of infection control nursing. An overall program outline has been developed by organizing the content in a sequence consistent with an approach which one would actually use in learning about infection control. The curriculum has been developed in written format with 6 sections. Each section has an introduction, and includes educational standards, interpretive statements and instructional objectives. The content (page 104) is arranged in a table which includes specific learning outcomes corresponding to the specific instructional objectives.

The educational standard and introduction at the beginning of each of the 6 sections indicates the intent of that section of the curriculum. The standard is further defined by interpretive statements that provide a framework for the content within the section, and instructional objectives which more specifically define content areas and expectations of the learner. The outline in table format is written in terms of the specific learning outcomes.

The specific learning outcomes use action verbs to indicate the

intended level of performance or achievement of that objective. Many of the interpretive statements use higher level verbs that require some integration of concepts of mastery. The instructional objectives and specific learning outcomes are generally written with lower level verbs that require recall and recognition for mastery rather than integration and synthesis skills.

The content section in the table is designed to provide information about the topics covered in the instructional objectives and the specific learning outcomes listed beside it. An outline format is used rather than the narrative style of most textbooks and journals. In the outline, points are covered in such a way that the learner can review the material and determine whether additional study is necessary to achieve the instructional objective. Lastly, the format of the curriculum was designed so that the entire document can be used for self assessment of knowledge and learning.

Several teaching/learning strategies will be utilized with the intent of facilitating the infusion model of instruction to promote critical thinking and decision making skills in the specific subject area of infection control. The important features of the infusion model include curriculum which is content-driven for expertise, critical thinking skills should be taught both implicitly and explicitly, and practice and instruction for transfer of thinking

skills must occur. Relevant classroom strategies include lecture/discussion, self-directed learning, and problem based learning.

Each session is organized with an initial 2 hour lecture with discussion format to review and/or elaborate upon the skills and information needed regarding the content. The lecture format provides a means of efficiently providing the learner with a large amount of factual information. Individual lectures will be augmented by the use of audio-visual aids and the use of subject-specialist guest speakers. The sessions are not in fact lectures in the traditional sense of the term. Rather, the approach is Socratic. Questions are continuously posed to the learners, to actively involve them in their acquisition of information. The learners' questions will also be welcomed at any time. Thus the initial 2 hours of class time focuses primarily on conditional behaviours.

The second part of the class (60-100 min) will focus on learning activities aimed at promoting information processing behaviours and critical thinking skills. Specific teaching strategies include small group discussion (Appendix 9 & 10), problem-based learning exercises, brainstorming sessions, journal writing and laboratory sessions. Actual case studies are incorporated into these strategies to make the activities more meaningful to the learner and to encourage transfer of problem-solving and critical thinking

skills. Appendix 11 provides an example of a problem-based learning exercise, while Appendix 12 illustrates a laboratory exercise, and Appendix 13, the journal guidelines. Furthermore, the format of the curriculum is offered to be used as a resource guide to self-study, congruent with the philosophy of adult learning and self-directed learning; it can supplement prior knowledge and guide learners in those areas where additional study is desired.

The classroom experience is just the initial component of the implementation of the infection control educational program. It is planned that the in-class learning experience is supplemented with significant staff interaction and follow-up in a mentorship relationship with the infection control practitioner and associated nurse educators. This will facilitate the transfer of not only knowledge, but also decision making skills and critical thinking skills to the clinical arena. By interacting with professionals who practice and embody a critical thinking spirit, the learner can model and practice desirable behaviours. Of course this interaction cannot be designed as a concrete learning experience, however, this factor itself also facilitates the adult learning principles of readiness and desire to learn. Retention will occur when the learner deals with an immediate learning need.

Thus, the infection control liaison program is designed as a

combination of cognitive and affective strategies to promote the infusion model of learning.

Program Evaluation

Systematic evaluation is seen as a necessary component of educational activities whether these activities consist of a one hour lecture or an entire degree course (Logan and Boss, 1993). Logan et al (1993) state that the goals of orientation are to provide information to a candidate which will allow him to perform the job against specific expectations and according to a position description. Evaluation can be viewed as gathering and combining performance data with a weighted set of goals, or comparing performance against standards. Selection of these themes emphasizes that the learner is only one component of the evaluation process. Other components for possible inclusion in the evaluation process are program evaluation, summative and formative evaluation, decision-making strategies, comparison of the performance of candidates and pre and post measurement of performance.

The evaluation process will be divided into the following three sections: 1) evaluation during the planning phase, 2) evaluation during the implementation period, and 3) evaluation after completion of the program. Evaluation during the planning phase of the program will involve

assessment of the relevance of the topics, assessment of needs and setting of goals. The initial determination of the relevance of the topics for the program will be conducted using a needs assessment questionnaire (Appendix 14). The use of a questionnaire allows access to a large number of learners and can assess learning needs, knowledge and understanding.

Evaluation during the implementation phase will involve assessing progress, tracking and monitoring activities, examining strategies and methods, and assessing the educational process. Answers will be sought for the following:

- are resources appropriate and available?
- are goals met within the expected time frames?
- what are the barriers or constraints
- is the educational environment supportive and encouraging?
- was there flexibility?
- were adult learning principles evident?

These questions may be answered by direct observation, interviews, group discussion and questionnaires and can be adapted for use as a check list (Appendix 15).

Future Implications

The third and final stage in the evaluation process involves a

determination of the efficiency and effectiveness of the program. Efficiency deals with whether the same results could be achieved in a different, more cost effective manner. To determine this, one must examine the relationship between the cost and benefits. Several outcome variables have been identified for the infection control liaison program (Appendix 16). Each of these outcome variables is measurable before and after the intervention (educational program). In this evaluation, the factors that will strengthen the arguments for a cause-effect relationship are the design as a time-series study, the temporal relationship, a change in nosocomial infection rate, and consistency of results across nursing units. These factors will be considered after implementation of the program in a retrospective examination and will not be included here.

In evaluating the program, six nursing units will receive the intervention and 6 will not. All measurements will be the same for all 12 units. An attempt will be made to control for the possibility that the groups receiving the intervention have more knowledge and experience about infection control and decision-making ability than the non-intervention group by testing the knowledge and decision-making ability of both groups prior to the intervention and controlling for this in the statistical analysis. An attempt will also be made to control for the possibility that one unit will

show a stronger effect in outcome measurements because their patients have a higher level of acuity or susceptibility by measuring these variables (infection rate/patient acuity) prior to the intervention, therefore establishing a baseline and then identifying a percent change from control. Additionally, the intervention and non-intervention nursing units will have similar infection rates, patient acuity rates and nursing workload measurements at the beginning of the study.

The evaluation will be modified time-series in that the intervention is only on six of the wards and the intervention is initiated on the six wards at the same time. The multiple pre- and post-test measurements will be the same for the intervention and non-intervention wards. The educational component is expensive and involves all the learners participating at the same time because the learning model is a participatory interactive learning model.

Effectiveness of the education program on the other hand, deals with whether the program has met its predetermined educational objective. The focus of this assessment is on the immediate results and on the long-term impact of the program. Effectiveness will be evaluated using the same questionnaire presented to learners prior to the educational intervention, as a post-intervention evaluation tool. Although specific individualized results

will not be assessed due to the confidential nature of the questionnaire, the learning outcomes will be assessed for the intervention groups compared to the control groups.

Conclusion

This project has discussed the theoretical constructs of critical thinking and teaching/learning principles as they apply to a curriculum in infection control nursing. What follows is the actual content and curriculum outline for an infection control nursing liaison educational program. The significance of this curriculum is to ensure more nurses can deal with infection control issues and individual patients with higher levels of skill and clinical expertise, and to empower nurses to participate in effective decision making.

Program Description

This course introduces basic and intermediate concepts of infection control practice including definitions and models of interventions and strategies for control.

Program Outline

Week 1	<ul style="list-style-type: none"> ◆ Program overview/Objectives/Expectations ◆ History of infection control practice ◆ Nosocomial Infections ◆ Sources of information
Week 2	<ul style="list-style-type: none"> ◆ Infectious agents ◆ Microbiology
Week 3	<ul style="list-style-type: none"> ◆ The Chain of Infection ◆ The Susceptible Host ◆ Infection ◆ Immunization ◆ Group Evaluation
Week 4	<ul style="list-style-type: none"> ◆ Infectious Diseases ◆ Methods of Control and Destruction ◆ Resistance ◆ Handwashing
Week 5	<ul style="list-style-type: none"> ◆ Patient Care Practices ◆ Asepsis ◆ Isolation
Week 6	<ul style="list-style-type: none"> ◆ Epidemiology ◆ Surveillance ◆ Outbreak Management ◆ Consultation
Week 7	<ul style="list-style-type: none"> ◆ Education of Peers ◆ Adult learning ◆ Communication Strategies ◆ Final Evaluation and Group Evaluation

Program Format

- ❑ The program will utilize a modified problem-based learning format involving:
 - a lecture and/or group discussion (120 min)
 - small group work (60 min)
 - self-directed learning time (40 min)
 - break (20 min)

- ❑ Each session will begin with a large group lecture and/or discussion outlining the theoretical concepts for the session

- ❑ Following the large group lecture and/or discussion, the small work groups will meet to review the sessions objectives and plan the session

- ❑ The last few minutes of each session should be dedicated to evaluation. You can complete the "Small Group Evaluation Guide" individually and discuss it briefly within the small work group

- ❑ There will be one 20 minute coffee break per session

- ❑ Final evaluation will consist of self-evaluation, group evaluation and a course evaluation. This will be facilitated through the use of written and verbal feedback

- ❑ The instructor will be available for 30 minutes prior to each session. This time will be available for learners to discuss any concerns with the instructor

SECTION 1

Microbiology

Medical microbiology is the branch of science concerned with the study of microorganisms that produce disease; the response of the host to infection; and the control of infectious disease. As such, it plays an integral role in the practice of infection control, because it defines one of the major component of the disease process, namely the agent. Fundamental knowledge of the nature of microorganisms, their anatomy, and physiology, and the nature of disease production will provide the Infection Control Liaison with an understanding of disease transmission, and the ability to develop strategies for intervention within the health care setting.

Properties of microorganisms important to disease occurrence are those related to perpetuation of the agents in the animate and/or inanimate environment, its contact with man, and how it produces disease. Because a basic understanding of human and microbial interactions is the foundation upon which infectious disease and infection control practices are built, the emphasis of this section is on those concepts. Those learners who desire more information regarding the technical laboratory aspects of specific organism identification are encouraged to use other resources available (spending a few days in the microbiology laboratory is an excellent method for developing some practical knowledge).

At the completion of this section , the learner should have acquired a familiarity with the microbial world, which will provide a framework for protocols to control the growth and movement of microorganisms among patients, personnel and the environment.

MICROBIOLOGY

Standard:

The infection control liaison should have knowledge of the basic principles of general, clinical and environmental microbiology in the prevention and control of infection among patients, employees, and visitors within the health care facility.

Interpretive Statement 1:

At the completion of this segment, the learner will have an understanding of the general characteristics of microorganisms and determine the impact on the human host

The learner will be able to:

- 1.1 identify the different types of microorganisms and classify them
- 1.2 Summarize microscopic characteristics of bacteria and physical conditions for their growth
- 1.3 Examine characteristics of bacteria which increase their pathogenicity
- 1.4 Analyze special aspects of viruses and their clinical importance
- 1.5 Identify parasites of clinical importance
- 1.6 Identify Fungi of clinical importance

Interpretive Statement 2:

At the completion of this segment, the learner will have an understanding of clinical microbiology and analyze its impact

The learner will:

- 2.1 Be able to analyze the range of interactions between microorganisms and human hosts**
- 2.2 Have an understanding of the collection, transport and interpretation of clinical microbiology specimens**
- 2.3 Have an understanding of the determination of susceptibility of bacteria to antimicrobial agents**

SECTION 2

Infectious Diseases

The objective of this section is to provide the Infection Control Liaison that body of knowledge of infectious disease important for the practice of infection control. The content of this section emphasizes material that is most pertinent to diagnosis, management, and prevention of nosocomial infection, rather than a broad approach to the general field of infectious diseases.

This section deals with several areas including principles of pathogenesis of infectious diseases and lays the foundation for the material that follows. Infections are also addressed from 2 different approaches: clinical syndromes (ie: urinary tract infections) and specific pathogens that have particularly important infection control implications (ie: hepatitis). The Infection Control Liaison is expected to acquire sufficient knowledge to 1) identify those condition requiring isolation or reporting, 2) use surveillance, 3) understand predisposing factors and prevention, and 4) appreciate the natural history, prognosis, and therapy of the various syndromes. The purpose of presenting the material in both ways is to emphasize that the Liaison may be required to consider an infection from wither a syndrome or a pathogen standpoint. The last part of the section deals with antimicrobial therapy.

To appreciate the material in this section fully, special reference to Section 1: Microbiology is essential.

INFECTIOUS DISEASES

Standard:

The infection control liaison should have a basic knowledge of the cause and control of disease

Interpretive Statement 1:

At the completion of this segment, the learner analyze the principles of pathogenesis of infectious diseases

The learner will be able to:

- 1.1 Generalize features of microbes that contribute to pathogenicity
- 1.2 Characterize the elements comprising the nonspecific host defense mechanisms
- 1.3 Characterize elements comprising the specific host defense mechanisms
- 1.4 Analyze causes and results of manipulation of the immune system

Interpretive Statement 2:

At the completion of this segment, the learner will have an understanding of infectious diseases, clinical syndromes and recommend implications for infection control

- 2.1 Urinary Tract Infections
- 2.2 Pneumonia

- 2.3 Surgical Wound Infections
- 2.4 Bacteremia
- 2.5 Gastroenteritis
- 2.6 Meningitis
- 2.7 Upper Respiratory Infections
- 2.8 Acquired Immune Deficiency Syndrome

Interpretive Statement 3:

At the completion of this segment, the learner will be able to compare the distinctive features of pathogens with special infection control implications

- 3.1 Clostridium difficile
- 3.2 Pseudomonas
- 3.3 Mycobacterium tuberculosis
- 3.4 Neisseria meningitidis
- 3.5 Staphylococcus aureus
- 3.6 Streptococcus
- 3.7 Herpes
- 3.8 Cytomegalovirus
- 3.9 Influenza
- 3.10 Varicella-zoster

3.11 Rubella

3.12 Rabies

3.13 Hepatitis

Interpretive Statement 4:

At the completion of this segment, the learner will have a basic understanding of antimicrobial therapy and its relationships to hospital infection control

The learner will:

- 4.1 Understand the basic principles of antimicrobial therapy**
- 4.2 Acquire a basic knowledge of antimicrobial resistance**
- 4.3 Justify basic principles of antimicrobial prophylaxis**
- 4.4 Be able to relate antimicrobial therapy to hospital infection control**

SECTION 3

Control and Destruction of Pathogens

Sterilization, disinfection and sanitation are integral parts of any hospital infection control program. With advanced technology, increasing medical instrumentation and sophisticated biomedical equipment, efficient and appropriate methods of sterilization, disinfection and sanitation are of primary importance in assuring a safe environment for patient care.

There is much scientific data upon which to base the practices involved in sterilization and disinfection of hospital equipment and supplies. There is also adequate technology to facilitate the process of sterilization and disinfection. However, outbreaks have been associated with improperly processed equipment. This is an area of infection control that can greatly influence patient care.

Hospital solid waste disposal is an area of infection control that has not been extensively researched and documented in the literature. Nevertheless, it is a concern which must be addressed in each facility.

Handwashing is the cornerstone of infection control. It requires neither advanced technology nor a sophisticated procedure. It does require an awareness of the importance of this single practice for the prevention of nosocomial infections.

At the completion of this segment, it is anticipated that the learner will have an understanding of principles and methods of cleaning, disinfection and sterilization of equipment and instruments, and acceptable methods of handwashing.

CONTROL AND DESTRUCTION OF PATHOGENS

Standard:

The infection control liaison should have a basic understanding of the principles used in sterilization, disinfection and sanitation in a health care facility

Interpretive Statement 1:

At the completion of this segment, the learner will be able to justify the principles of cleaning, disinfection and sterilization

The learner will be able to:

- 1.1 Differentiate between the appropriate use of cleaning, disinfection and sterilization
- 1.2 Rank principles and methods of cleansing equipment and supplies
- 1.3 Justify principles and methods of disinfection of equipment and supplies
- 1.4 Support principles and methods of sterilization of equipment and supplies

Interpretive Statement 2:

At the completion of this segment, the learner will have an understanding of the principles of sanitation

The learner will be able to:

- 2.1 Describe acceptable methods for management of hospital solid waste
- 2.2 Discuss handwashing and use of antiseptic
- 2.3 Automatically demonstrate appropriate handwashing technique

SECTION 4

Patient Care Practices

In order to develop approaches to reduce the risk of nosocomial infections, the Liaison needs to integrate knowledge of the pathogenesis of infectious diseases, modes of transmission of microorganisms, and an understanding of patient care practices in health care facilities. This section will acquaint learners with 1) host factors that influence infection risk, 2) procedures and devices known or believed to be associated with an increased infection risk and 3) interventions known or believed to reduce the risk. It is generally agreed that the greatest potential for prevention of nosocomial infections lies with reducing risks associated with procedures and devices.

This section describes infection control principles associated with general patient care activities. Guidelines for isolation procedures and a discussion of medical versus surgical asepsis are among the topics covered. In preparation for reviewing this section, the liaison is directed to the following resources:

1. A general textbook of anatomy and physiology.

An understanding of normal anatomy and physiology is a prerequisite to an understanding of the body systems and pathogenesis of infectious diseases.

2. A general textbook of medical and surgical nursing practice.

Such a textbook may be useful in delineating the specific nursing activities involved in procedures such as surgical wound dressing, and other routine activities of patient care.

PATIENT CARE PRACTICES

Standard:

The infection control liaison should have a comprehensive knowledge and understanding of therapeutic and diagnostic measures, equipment and procedures used in patient care as related to infection control

Interpretive Statement 1:

At the completion of this segment, the learner will have an understanding of the infection control principles influencing general patient care practices

The learner will be able to:

- 1.1 Analyze methods to assess which hospital populations may be at risk of nosocomial infection
- 1.2 Assess the implications of personnel practices for infection control
- 1.3 Evaluate procedures or personnel for compliance with principles of aseptic technique
- 1.4 Plan and/or evaluate the appropriateness of isolation procedures

Interpretive Statement 2:

At the completion of this segment, the learner will be able to describe infection control strategies for the patient with an alteration of a body system

- 2.1 Cardiovascular System**
- 2.2 Gastrointestinal System**
- 2.3 Neurological System**
- 2.4 Genitourinary System**
- 2.5 Integumentary System**
- 2.6 Musculoskeletal System**
- 2.7 Respiratory System**

SECTION 5

Epidemiology

One goal of epidemiology is to understand the natural history of disease in order to develop strategies of prevention and control. The infectious disease process is a complex interrelationship of agent, host, and environment that is defined by epidemiology. By becoming familiar with these concepts, the Infection Control Liaison will begin to develop a knowledge base for interpreting data gathered within the health care facility, understanding the association between risk factors and infection in the hospital setting and how these findings can be used to influence patient care.

Some information has been provided about the theoretical basis for epidemiology and statistics, but the goal is to present practical information that will allow the Liaison to use epidemiological skills in the day to day practice of infection control.

At the completion of this section, it is hoped that the learner will have a better understanding of the place of nosocomial infections in the total discipline of epidemiology, how principles of epidemiology can be applied to infection control practice and how statistics can be a useful tool for data analysis and interpretation.

EPIDEMIOLOGY

Standard:

The infection control liaison should have a basic knowledge of epidemiological principles and statistical methods relevant to infection control

Interpretive Statement 1:

At the completion of this segment, the learner will have an understanding of the principles of epidemiology

The learner will be able to:

- 1.1 Define epidemiology in general terms
- 1.2 Describe general epidemiological principles
- 1.3 Place the epidemiology of nosocomial infections into perspective within the broad discipline of epidemiology
- 1.4 Compare and contrast terms useful in describing infectious diseases
- 1.5 Analyze the infectious disease process
- 1.6 Internalize strategies to interrupt the chain of infection through control measures in the health care setting
- 1.7 Justify epidemiological approaches to causes, prevention and control of disease
- 1.8 Appraise outcome related events in evaluation of a successful infection control program

Interpretive Statement 2:

At the completion of this segment, the learner will be able to assist in the development of a surveillance system based on sound epidemiological principles

The learner will be able to:

- 2.1 Define disease surveillance in general terms
- 2.2 Describe, in general, sources and uses of data for disease surveillance
- 2.3 Analyze elements of a health care facility surveillance system
- 2.4 Justify approaches for surveillance of nosocomial infections

Interpretive Statement 3:

At the completion of this segment, the learner will have an understanding of outbreak investigation

The learner will be able to:

- 3.1 Analyze the necessary components of an outbreak investigation
- 3.2 Justify of the activities associated with each phase or outbreak investigation
- 3.3 Be able to assist in the implementation of the necessary steps in an investigation

SECTION 6

Education

In the everyday work experience, the Infection Control Liaison assesses the needs and skills necessary to change thinking, attitudes and performance of health care personnel. Recognizing that hospital infection control may not be the top priority of all health care personnel, the liaison can facilitate the process of introducing new ideas and effect appropriate changes in behaviour comparable with the practice of infection control.

The educational needs of health care personnel, institutions and communities are interrelated. The art of listening and questioning, the action of identifying problems and needs, the use of research and investigation, the sharing and exploring of ideas and finding viable solutions are all part of the teaching-learning process.

The focus of this section is on the adult learner, educational principles and teaching styles and techniques. Major theories of the learning process are described to illustrate the broad historical perspective and to encourage the participant to find a teaching modality in keeping with personality, experience in learning, and motivation to learn and share knowledge.

EDUCATION

Standard:

The infection control liaison should have knowledge of the teaching and learning principles necessary for assisting with the development, implementation and evaluation of educational programs related to infection control

Interpretive Statement 1:

At the completion of this segment, the learner will have an understanding of the principles of adult learning

The learner will be able to:

- 1.1 Assess learning as a process of growth and change
- 1.2 Describe the goals of the educational process as related to the adult learner
- 1.3 Contrast major theories which influence the development of adult educational programs as related to the practice of infection control

Interpretive Statement 2:

At the completion of this segment, the learner will understand the impact of physical, psychological and intellectual influences on adult learning

The learner will be able to:

- 2.1 Characterize the adult learner as influenced by self-concept, experience, readiness, and orientation to learning
- 2.2 Assess the impact of physical, psychological and intellectual changes which influence adult learning

Interpretive Statement 3:

At the completion of this segment, the learner will have an understanding of the educational needs within the institution

The learner will be able to:

- 3.1 assess the educational needs of the target or intended learner population
- 3.2 assess various learning needs depending on levels of clinical expertise

Outcomes	Content	Strategy
6. Analyze variables that influence the use of preventative measures	Triandis Health Belief Model a) risk perception b) benefits c) supporting factors d) barriers	1. Problem-based Case Study: Health Belief Model 2. Journal
7. Describe the nurses' professional role re: infection control practices	1. 1996 College of Nurse's Infection Control Guidelines 2. College of Nurse's Standards of Practice	
8. Describe the nurses' role re: occupational health and safety	Occupational Health and Safety Guidelines	1. Lecture 2. Discussion 3. Handouts
9. Discuss different sources for acquiring pt. information	1. Nursing assessment 2. Physician's notes 3. Patient records 4. Laboratory results 5. Patient interview	
10. Analyze the 6 components of the infectious disease process (Chain of Infection)	1. Susceptible host 2. Causative agent 3. Reservoir 4. Portal of exit 5. Mode of transmission 6. Portal of entry	1. Discussion
		1. Problem-based Case Study: Chain of Infection

Outcomes	Content	Strategy
<p>11. Define the following terms:</p> <ul style="list-style-type: none"> aerobic anaerobic antibody antibiotic antigen asepsis carrier colonization contamination culture epidemic fomite host incubation period infection inflammation microbiology mode of transmission nosocomial infection pathogenic pathogenicity reservoir resistance sensitivity sepsis sterile surveillance virulence 		<ul style="list-style-type: none"> 1. Self-directed learning time 2. Small-group discussion

Outcomes	Content	Strategy
<p>12. Recognize biological agents of infectious disease</p> <p>13. Bacteria</p> <p>a) state 2 types of bacteria</p> <p>b) list the beneficial effects of non-pathogenic bacteria</p> <p>c) state the effects of pathogenic bacteria on the body</p> <p>d) list 3 main groups of bacteria</p> <p>e) describe 3 diseases caused by each in (d)</p> <p>f) define flora</p> <p>g) state the benefits of body flora</p> <p>h) discuss the potential hazard of body flora</p> <p>i) name the common flora of the skin and intestines</p>	<p>1. Bacteria 2. Protozoa 3. Fungi: yeast & mold 4. Virus 5. Helminth</p> <p>pathogenic/non-pathogenic</p> <p>a) decompose refuse b) improve soil fertility c) make vinegar, yogurt, cheese</p> <p>invade tissue and secrete enzymes and/or toxins</p> <p>a) cocci: gonorrhoea, meningitis, pneumonia b) bacilli: anthrax, botulism, tetanus c) spirilla: syphilis, yaws, rat bite fever</p> <p>1. Flora (commensal organisms) may be transient or resident 2. May be normal in one part of the body but infectious in another ie: E-coli 3. Benefits: competitive inhibition Vitamin K synthesis in intestines affect pH : lactobacillus in vagina aids absorption of nutrients 4. Hazards: proliferation may become pathogenic may reside in another body part</p> <p>Skin: staph aureus, staph epidermis Intestine: E. coli, shigella, salmonella</p>	<p>1. Lecture: guest speaker Microbiologist</p> <p>2. Discussion</p> <p>3. Tour of Laboratory</p> <p>4. Laboratory exercise in Small groups: Normal Body Flora</p>

Outcomes	Content	Strategy
<p>j) discuss the relationship between specific bacteria causing a disease or condition</p> <p>k) define spore</p> <p>l) describe how specific microorganisms survive through spore formation</p> <p>14. Protozoa</p> <p>a) state 2 beneficial effects of non-pathogenic protozoa</p> <p>b) state 2 diseases caused by protozoa</p> <p>15. Fungi: Yeasts & Molds</p> <p>a) state 2 non-pathogenic effects of yeasts</p> <p>b) state 2 pathogenic effects of yeasts</p> <p>c) state 2 non-pathogenic effects of molds</p> <p>d) state 2 pathogenic effects of molds</p>	<p>Specific bacteria target specific organs</p> <p>when less than optimum growing conditions arise ie: lack of food etc, some bacteria can survive in the form of spores since they are very resistant to destruction. When favourable conditions exist, the spore then germinates into the bacteria: C. difficile can survive in spore formation in the environment for several months</p> <p>a) maintain fertility of soil b) purify sewage and waste</p> <p>a) amoebic dysentery b) malaria</p> <p>a) source of vitamin B and protein b) fermentation</p> <p>a) opportunistic infections b) thrush, candida albicans</p> <p>a) penicillin b) cheese</p> <p>a) athlete's foot b) ringworm</p>	<p>1. Lecture 2. Discussion 3. Self-directed learning time</p>

Outcomes	Content	Strategy
<p>16. Virus:</p> <p>a) clarify the factors that make viruses difficult to destroy</p> <p>b) list 10 common diseases caused by viruses</p> <p>17. Helminths</p> <p>a) describe how helminths usually enter the body</p> <p>b) name 3 parasitic worms that cause disease</p> <p>17. Generalize attributes of microorganisms which affect their ability to cause disease</p> <p>18. List characteristics of microorganisms associated with pathogenicity</p> <p>19. Classify bacterial toxins</p>	<p>Viruses live inside the host cell and reproduce via cellular DNA; thus host cell must be killed</p> <p>common cold, warts, cold sores, rabies, mumps, hepatitis, measles, rubella, polio, HIV, shingles, smallpox</p> <p>Food or water contaminated by faeces</p> <p>hookworm, tapeworm, pinworm</p> <p>1. Invasiveness 2. Pathogenicity 3. Virulence 4. Infectious dose 5. Viability 6. Host specificity 7. Antigenic variation</p> <p>1. Toxin production 2. Extracellular enzymes 3. Resistance to enzymatic attack 4. Arterial adherence</p> <p>a) exotoxin b) endotoxin</p>	<p>1. Lecture 2. Discussion 3. Self-directed learning time</p>

Outcomes	Content	Strategy
<p>20. Distinguish between the characteristics of endo- and exotoxins</p>	<ol style="list-style-type: none"> 1. Chemical structure 2. Source 3. Type of organism 4. Resistance to heat 5. Antigenicity 6. Action 7. Enterotoxins 8. Neurotoxins 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Self-directed learning time
<p>21. Examine the physical conditions required for the growth of bacteria</p>	<ol style="list-style-type: none"> 1. Nutrition 2. Temperature 3. Atmospheric conditions: aerobic/anaerobic 4. Moisture 5. Darkness 6. Acidity/alkalinity 	
<p>22. Discuss the result when micro-organisms are deprived of one or more of the conditions for growth</p>	<p>limit or inhibit growth or reproduction</p>	
<p>23. Justify the general principle for the prevention of growth of microorganisms</p>	<ol style="list-style-type: none"> 1. Interfere with disease transmission 2. Reduce susceptible population 3. Reduce reservoirs 4. Provide unfavourable conditions for growth 	

Outcomes	Content	Strategy
<p>24. Identify general considerations for collection of specimens which may affect laboratory results</p>	<ol style="list-style-type: none"> 1. Stage of disease 2. Stage of antimicrobial therapy 3. Appropriateness of specimen for suspected pathogen/disease process 4. Sufficient quantity of specimen 5. Prompt delivery to laboratory 6. Appropriate collection technique (prevent contamination by contiguous flora) 7. Sufficient clinical information to laboratory 	<ol style="list-style-type: none"> 1. Lecture with Guest speaker: Infectious Disease physician 2. Discussion 3. Small group work
<p>25. Identify important factors to be considered for specimen collection</p>	<ol style="list-style-type: none"> 1. Patient instruction 2. Number of specimens 3. Collection technique 4. Volume 5. Transport media 6. Proper handling of specimen 	
<p>26. Explain the rationale for performing susceptibility tests on bacterial isolates</p>	<ol style="list-style-type: none"> 1. Choice of appropriate regimen of antimicrobial therapy 2. Development of resistance to antimicrobial 3. Variability of bacterial patterns to antimicrobial agents 4. Identification of outbreaks 5. Epidemiological purposes 	

Outcomes	Content	Strategy
<p>27. State the common reservoirs for microorganisms</p>	<p>1. Plant 2. Animal 3. Environment/fomites</p>	
<p>28. List 3 common reservoirs associated with nosocomial infection agents</p>	<p>1. Patients 2. Health care personnel 3. Health care equipment and environment</p>	<p>1. Lecture 2. Discussion 3. Problem-based case study: Chain of Infection</p>
<p>29. List 2 major types of human reservoirs</p>	<p>cases: acute clinical cases sub-clinical cases (asymptomatic)</p> <p>carriers: Incubatory carriers (prodromal period) convalescent carriers chronic or sustained carriers intermittent carriers</p>	
<p>30. Explain why sub-clinical cases and carriers present a risk of transmission to susceptible hosts in the health care facility</p>	<p>1. Decreased recognition and identification 2. Less precautionary measures since illness not apparent 3. Carrier state can persist for indefinite period of time for specific diseases</p>	
<p>31. List the portal of exit associated with human and animal reservoirs</p>	<p>a) respiratory tract b) genitourinary tract c) gastrointestinal tract d) skin/mucous membranes e) transplacental (mother to fetus) f) blood</p>	

Outomes	Content	Strategy
<p>34. Analyze some characteristics of the host which influence susceptibility to and severity of disease and discuss each</p>	<p>a) age b) sex c) ethnicity d) socioeconomic status e) marital status f) disease history/underlying disease g) lifestyle h) heredity i) nutritional status j) occupation k) immunization status l) diagnostic/therapeutic procedures m) medications n) pregnancy o) trauma</p>	<p>1. Lecture 2. Discussion 3. Self-directed learning time</p>
<p>35. Justify why the body provides a favourable environment for the growth of microorganisms</p>	<p>1. Moisture 2. Food: sugar and nitrogen 3. Oxygen 4. Favourable temperature 5. Neutral medium</p>	
<p>36. Discuss the harmful effects of pathogens entering the body</p>	<p>a) tissue destruction b) production of toxins c) physical discomfort</p>	

Outcomes	Content	Strategy
<p>37. a) state 2 common responses of the body to infection</p> <p>b) list the signs of inflammation and explain their causes</p> <p>c) discuss why moderate fever is a desirable response to infection</p> <p>38. Differentiate between colonization and infection</p>	<p>Fever and inflammation</p> <p>a) heat b) redness c) edema d) pain e) limitation of function</p> <p>1. Increased temperature can deactivate the enzymatic action of microorganisms 2. Increased blood flow brings more phagocytes to the area of invasion</p> <p>Colonization chronic carriage intermittent carriage transient carriage resident flora transient flora</p> <p>Findings: few polymorphonuclear leukocytes few bacteria multiple bacterial species</p> <p>Infection inapparent infection disease</p> <p>Findings: presence of many PMN's large number of organisms revealed predominance of a single organism</p>	<p>1. Lecture with Guest speaker: Researcher</p> <p>2. Discussion</p>

Outcomes	Content	Strategy
<p>39. Differentiate between organisms that are usually pathogens, commonly opportunistic and only occasionally opportunistic</p>	<p>Usually pathogenic: capable of producing disease in normal, susceptible persons</p> <p>Commonly opportunistic: produce disease in hosts with impaired defenses</p> <p>Occasionally opportunistic: pathogenic only when other factors overwhelmingly favour the microbe</p>	<p>1. Lecture 2. Discussion 3. Brainstorming</p>
<p>40. Identify body sites which are normally sterile</p>	<p>a) trachea, bronchi and sinuses b) cerebrospinal fluid c) blood d) bladder e) peritoneal fluid, joint fluid</p>	
<p>41. Compare non-specific host defence mechanisms</p>	<p>1. Natural barriers to entry of organisms 2. Normal microbial flora 3. Lysozyme (antimicrobial substance) 4. Polymorphonuclear leukocytes and other phagocytes 5. Alternate complement pathway 6. Interferon 7. Null cells</p>	
<p>42. Analyze defence mechanisms of the skin and mucosal surfaces which function as natural barriers to entry of organisms</p>	<p>Skin: intact skin (prevent penetration) antimicrobial properties ie: dryness low Ph normal skin flora</p>	

Outcomes	Content	Strategy
<p>43. Characterize the normal microbial flora</p> <p>44. Discuss the origin and role of lysozyme</p>	<p>Mucosal surface: vibrissae (nasal hair) airflow turbulence in upper airway cilia antibacterial secretions alveolar macrophages & tissue histocytes secretory immunoglobulin</p> <p>GI tract: low Ph Intestinal secretions lysozyme normal microbial flora secretory immunoglobulin</p> <p>Resistance to colonization through microbial interactions: production of adverse environment; pH, oxygen tension competition for nutrients production of inhibitors competition for same receptor sites on epithelial cells</p> <p>Antimicrobial substance produced by lining cells and found in all secretions bathing mucosal surfaces Enzyme lyses the cell wall of bacteria</p>	<p>1. Lecture 2. Discussion 3. Laboratory in small groups: Inflammation vs. Infection</p>

Outcomes	Content	Strategy
<p>45. Describe the phagocytic cells system</p>	<p>Components: PMN's and neutrophils Cells of the reticuloendothelial system a) macrophages (tissue histocytes) b) Kupffer cells (liver) c) cells linings sinuses, spleen, lymph</p> <p>Granulocytes: neutrophils (protection from microbes) basophils (no role in resistance to infection) eosinophils (role in hypersensitivity reactions)</p>	<p>1. Lecture 2. Discussion</p>
<p>46. Identify stages of PMN function in host defence</p>	<p>1. Migration to infection site 2. Opsonization 3. Phagocytosis 4. Degranulation and killing</p>	
<p>47. Identify and describe the terms associated with white blood cells count</p>	<p>1. Normal WBC 2. Leukocytosis 3. Leukopenia 4. Neutropenia</p>	
<p>48. Characterize the complement system</p>	<p>1. 9 serum proteins activated in sequence; present in serum 2. Classical pathway: activated by antigen/antibody complexes 3. Alternate pathway: activated by the absence of antibody 4. Major component of host defences 5. Release factors which attract phagocytic cells 6. Enhance phagocytosis and lysis 7. Produce anaphytoxins to increase vascular permeability</p>	

Outcomes	Content	Strategy
49. Describe the origin of interferon	<ol style="list-style-type: none"> 1. Nonspecific glycoprotein produced by a virus infected host cell 2. Prevent subsequent viral replication 3. main significance: host defence against viral infection and a possible immunoregulatory role 	
50. Identify and characterize null cells	<ol style="list-style-type: none"> 1. Active in cytotoxic events which do not require memory 2. Resemble lymphocytes but derived from marrow stem cells 3. Possess surface receptors 	
51. Discuss components and cells of the specific host defence system	<p>Humoral immune system: B lymphocytes Cellular immune system: T lymphocytes</p>	
52. Describe the humoral immune system	<ul style="list-style-type: none"> . origin, location, life span of B cells . production of immunoglobulin by B cells . structure: activity relationship of immunoglobulins . classes: IgG IgA IgM IgD IgE . maternal transfer of antibody transplacental colostrum . functions of B cells of the humoral system . ways to evaluate integrity of the humoral immune system 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Self-directed learning time

Outcomes	Content	Strategy
<p>53. Describe the cellular immune system (cell-mediated immunity or CMI)</p>	<ul style="list-style-type: none"> . origin, lifespan, location of T cells . comparison of T cells and B cells . T cell response to an antigen . types of T cells <ul style="list-style-type: none"> helper T cells suppressor T cells . functions of T cells . types of lymphokines <ul style="list-style-type: none"> transfer factors lymphocyte activating factor migration inhibiting factor macrophage activation factor lymphotoxin interferon chemotactic factor . the interaction between macrophages and T cells . ways to evaluate the integrity of the cellular immune system 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Self-directed learning time
<p>54. Describe hypersensitivity reactions</p>	<p>types: direct (immediate) - foreign antigen & antibody</p> <p style="padding-left: 20px;">delayed - T cells involved</p> <ul style="list-style-type: none"> . features of delayed hypersensitivity response . pathophysiologic features of a "positive" skin test 	
<p>55. Describe immunization</p>	<p>a) active immunization: use of specific antigen to stimulate production of protective specific antibodies</p>	

Outcomes	Content	Strategy
<p>56. Give examples of the types of vaccines commonly used to protect against infections</p> <p>57. Differentiate between natural and acquired immunity</p> <p>58. Differentiate between the 2 methods of obtaining active acquired immunity</p> <p>59. Describe 2 methods of obtaining passive immunity</p>	<p>b) passive immunization: already contains antibody to confer immunity</p> <p>1. Live virus (attenuated, not to cause disease) measles mumps rubella polio (oral; Sabin) yellow fever</p> <p>2. Killed or inactivated organisms pertussis typhoid cholera polio (Salk) Influenza Hepatitis B</p> <p>3. Toxoids (modified toxins) diphtheria tetanus</p> <p>4. Purified polysaccharides pneumococcal vaccine meningococcal vaccine</p> <p>Natural: immunity with which we are born Acquired: reaction that occurs as a result of exposure; may be active or passive</p> <p>natural or artificial (vaccine or toxoid)</p> <p>in utero or artificial</p>	<p>1. Lecture 2. Discussion 3. Problem-based case study: Immunity</p>

Outcomes	Content	Strategy
<p>60. Analyze the clinical manifestations of the following infectious diseases:</p> <ul style="list-style-type: none"> a) Bacteremia b) C. difficile c) Cytomegalovirus d) Gastroenteritis e) Gram negative organisms f) Gram positive organisms g) Hepatitis h) Herpes i) HIV j) Influenza k) Meningitis l) Pediculosis m) Pneumonia n) Rabies o) Scabies p) Surgical wound infections q) Staph. aureus r) Tuberculosis s) Upper respiratory tract infections t) Urinary tract infection u) Varicella zoster (chickenpox) 	<ul style="list-style-type: none"> 1. Define terms 2. List etiological agents 3. Describe epidemiology 4. Incubation period 5. Communicability 6. Host risk factors 7. Reservoir 8. Portal of entry 9. Portal of exit 10. Mode of transmission 11. Clinical manifestations 12. Potential Complications 13. Diagnostic tests for confirmation 14. Methods for prevention 15. Treatment 	<ul style="list-style-type: none"> 1. Lecture 2. Discussion 3. Self-directed learning time 4. Problem-based Case Study: Infectious Diseases

Outcomes	Content	Strategy
<p>61. Evaluate the implication of cell structure, metabolism and replication for antimicrobial use and efficacy</p>	<p>1. Inhibition of cell wall synthesis 2. Alteration in cell membrane permeability 3. Inhibition of protein synthesis (ie: replication) 4. Inhibition of nucleic acid synthesis</p>	<p>1. Lecture with Guest speaker: Infectious Disease Resident 2. Discussion</p>
<p>62. Differentiate between antimicrobial and antibiotic</p>	<p>Antimicrobial: inhibits or kills microbes Antibiotic: is an antimicrobial fully or partially synthesized by a microorganism</p>	
<p>63. Identify the major groups of antimicrobials</p>	<p>1. Antibacterials Penicillins Cephalosporins Aminoglycosides Tetracyclines Sulfonamides Polymyxins Chloramphenicol Macrolides Miscellaneous 2. Antifungals 3. Antivirals 4. Antiparasitics</p>	
<p>64. Describe the action of antimicrobial agents on microorganisms</p>	<p>Microbistatic: prevent or limit proliferation or multiplication Microbicidal: kill microorganisms</p>	
<p>65. Compare the appropriate reasons for antimicrobial use</p>	<p>1. Infection treatment (therapy) 2. Prophylaxis against possible infection 3. Eradication of a carrier state</p>	

Outcomes	Content	Strategy
<p>66. Justify the basis on which antimicrobial therapy of infection may be selected</p>	<ol style="list-style-type: none"> 1. Specific therapy <ul style="list-style-type: none"> . the infecting agent is known . antimicrobial susceptibility has been performed . therapy is selected to be the most specific and least toxic possible 2. Empiric therapy <ul style="list-style-type: none"> . no information about a causative pathogen is known . the patient is sufficiently ill to warrant treatment before C&S tests are available . the clinical site of infections may give an indication of likely pathogens . usually broad in spectrum due to uncertainty about the causative agent 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Self-directed learning time
<p>67. Analyze major factors which contribute to successful antimicrobial therapy</p>	<ol style="list-style-type: none"> 1. Virulence and susceptibility of the infecting organism to the antimicrobial (the "bug" factor) 2. Delivery of the antimicrobial to the site of infection (the "drug" factor) 3. The underlying condition and immunocompetence of the infected patient (the host factor) 	
<p>68. Examine factors in microbial administration which affect the outcome of therapy</p>	<ol style="list-style-type: none"> 1. Appropriate dosage 2. Appropriate route 3. Drug-drug interactions 4. Body sites which may require special therapeutic intervention (ie: abscess) 5. Problems with antimicrobial administration 	

Outcomes	Content	Strategy
<p>69. Assess common undesirable effects of antimicrobials</p>	<ol style="list-style-type: none"> 1. Allergic reactions 2. Gastrointestinal disturbances 3. Toxicity 4. Superinfection due to suppression of normal flora 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Small group work
<p>70. Discuss reasons why antimicrobial resistance is important to nosocomial infection</p>	<ol style="list-style-type: none"> 1. Prognosis for successful treatment of the patient is worse that with susceptible organisms 2. special efforts to control hospital spread of resistant organism may be required 	
<p>71. Identify the genetic bases of resistance to antimicrobials</p>	<ol style="list-style-type: none"> 1. Chromosomal changes 2. Extrachromosomal changes 	
<p>72. Identify major mechanisms of antimicrobial resistance</p>	<ol style="list-style-type: none"> 1. Increased drug destruction 2. Decreased Drug activation 3. Formation of an altered drug-receptor 4. Decreased drug permeability 5. Development of alternate metabolic pathways 	
<p>73. Describe examples of antibiotic resistance that have been found in hospitals</p>	<ol style="list-style-type: none"> 1. Penicillinase-producing staphylococcus aureus 2. Methicillin resistant staphylococcus aureus 3. Acinetobacter 4. Vancomycin resistant enterococcus 	
<p>74. Compare examples of situations in which antimicrobial prophylaxis may be used</p>	<ol style="list-style-type: none"> 1. Surgical Procedures 2. Certain unique medical conditions ie: endocarditis, heart valve problems 	

Outcomes	Content	Strategy
75. Describe the three reservoirs of hospital flora	<ol style="list-style-type: none"> 1. Patient flora 2. Personnel flora 3. Environmental flora 	<ol style="list-style-type: none"> 1. Lecture with Guest Speaker: Pharmacist 2. Discussion
76. Compare methods to change antimicrobial usage and the likelihood of success with each method	<ol style="list-style-type: none"> 1. Restriction/removal of specific drugs (effective) 2. Education of users (less effective) 3. Antimicrobial review/audit (less effective) 4. Establishment of antimicrobial therapy standards (less effective) 5. Modify physician order form to encourage rationale usage (possibly effective) 	
77. Assess how patient care may be improved through appropriate use of antibiotics	<ol style="list-style-type: none"> 1. Improved response to treatment (less morbidity, lower mortality) 2. Reduction in adverse drug reactions 3. Reduction in hospital antibiotic resistance 4. Reduction in antibiotic costs 	
78. Identify hospital personnel likely to be of assistance in antimicrobial usage control	<ol style="list-style-type: none"> 1. Infectious disease physician 2. Pharmacists 3. Chief of staff 4. Infection Control Practitioner 5. Quality assurance committee 6. Members of Pharmacy and Therapeutic committee 	
79. Recognize methods other than antimicrobial audits to control spread of drug-resistant organisms in the hospital	<ol style="list-style-type: none"> 1. Isolation precautions for infected patients 2. Identification and isolation of asymptomatic carriers 	

Outcomes	Content	Strategy
<p>80. Compare 5 physical agents which destroy or inhibit the growth of pathogens and give an example of each</p> <p>81. Name the chemical agents used to destroy or inhibit the growth of pathogens</p> <p>82. Discuss the single most important control measure to break the chain of infection</p>	<p>3. Education of personnel and patients</p> <ul style="list-style-type: none"> . significance and nature of the resistance problem . review of the means of interrupting transmission <p>4. Reinforcement of routine practices</p> <ul style="list-style-type: none"> . handwashing . catheter care . respiratory care . other procedures that may be implicated <p>5. Identification and follow-up of carriers on readmission</p> <p>1. Cold: preserving food</p> <p>2. Drying: preserve milk, fruit</p> <p>3. Light: UV lamps</p> <p>4. Heat: incinerators</p> <p>5. Filters: membrane filters</p> <p>1. Antiseptic: iodine, alcohol, hydrogen peroxide</p> <p>2. Disinfectant: phenol, formaldehyde, chlorine</p> <p>Handwashing:</p> <ul style="list-style-type: none"> a) soap b) running Water c) 10 seconds of friction 	<p>1. Lecture</p> <p>2. Discussion</p> <p>3. Laboratory in small groups: Handwashing</p>

Outcomes	Content	Strategy
<p>83. Justify the purpose of handwashing during patient care and internalize the importance</p>	<p>To remove transient microbial contamination acquired by recent contact with infected or colonized patients or environmental sources</p>	
<p>84. Determine indications for handwashing</p>	<p>1. Before invasive procedures 2. Before and after contact with wounds 3. Before contact with particularly susceptible patients: patients with catheters/invasive devices patients with depressed host-resistance newborns 4. After contact with a source likely contaminated with virulent microorganisms 5. Between contact with different patients</p>	<p>1. Lecture 2. Discussion 3. Brainstorming</p>
<p>85. Identify three factors found to be associated with increased frequency of handwashing by health care personnel</p>	<p>1. Preventing the spread of infection among patients 2. Preventing one's self from acquiring an infection 3. Having contact with patients</p>	
<p>86. Identify three factors contributing to decreased frequency of handwashing by health care personnel</p>	<p>1. Personnel are too busy 2. Personnel have minimal contact with infectious patients 3. The handwashing agent is detrimental to the skin</p>	

Outcomes	Content	Strategy
<p>87. Recognize that all individuals with activities within a health care facility may have some exposure to microorganisms</p> <p>88. Discuss some infection control implications of inadequate numbers of patient care personnel</p> <p>89. Identify practices that may decrease the risk or transmission of microorganisms within a health care facility</p>	<p>Risk of nosocomial infection is related to mode of transmission of the agent, the type of patient care activity or procedure being done and the patient's underlying host defenses. Duration of exposure and pathogenicity of the infectious agents also influence infection risk.</p> <p>1. Decreased compliance with routine policies and procedures ie: handwashing</p> <p>2. Decreased participation in educational programs</p> <p>3. Increased rotation of personnel between patient care areas and decreased familiarity with specific procedures</p> <p>4. Use of outside personnel</p> <p>5. Inadequate numbers of personnel to implement control measures in an outbreak situation</p> <p>1. Personnel practices: compliance, hygiene</p> <p>2. Environmental practices: housekeeping</p> <p>3. Patient placement: adequate space, cohorting, separation</p> <p>4. Patient hygiene: skin care, care of secretions/excretions</p> <p>5. Patient teaching</p> <p>6. Visitor guidelines</p> <p>7. Discharge planning</p>	<p>1. Lecture</p> <p>2. Discussion</p> <p>3. Brainstorming</p>

Outcomes	Content	Strategy
<p>90. Support the basic principles underlying practices of asepsis</p>	<ol style="list-style-type: none"> 1. Microorganisms are capable of causing illness 2. Microorganisms harmful to man can be transmitted by direct or indirect contact 3. Illness caused by microorganisms can be prevented when there is an interruption of the infectious disease process 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Self-directed learning time
<p>91. Differentiate between application of medical and surgical asepsis</p>	<ol style="list-style-type: none"> 1. Medical Asepsis: <ol style="list-style-type: none"> a) reduce numbers of skin microorganisms by handwashing or cleaning b) use barrier techniques to reduce microbial transmission from patient to personnel c) provide environmental controls to reduce microbial transmission 2. Surgical Asepsis <ol style="list-style-type: none"> a) provide maximum reduction of skin microorganisms without damaging tissue b) use barrier techniques to decrease transmission of microorganisms from personnel to patients c) provide environmental controls to reduce contamination maximally 	
<p>92. Analyze patient care situations where medical asepsis should be required</p>	<ol style="list-style-type: none"> 1. All patient care activities 2. Care of patients with communicable illness 3. Non-surgical procedures of body systems 	

Outcomes	Content	Strategy
<p>93. Analyze situations (in addition to the surgical suite) where use of surgical asepsis is appropriate</p>	<ol style="list-style-type: none"> 1. During procedures associated with a high risk of infection due to interruption of normal host defences 2. During preparation and administration via vascular catheters 3. For high risk populations ie: burn patients 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Laboratory exercise in small groups: Isolation precautions
<p>94. Assess common isolation categories used by health care facilities</p>	<ol style="list-style-type: none"> 1. Airborne precautions 2. Droplet precautions 3. Contact precautions: Direct 4. Contact precautions: Indirect 	
<p>95. Generalize the strategies of disease prevention specific to isolation techniques used in the health care setting</p>	<ol style="list-style-type: none"> 1. Control or eliminate the agents 2. Control or eliminate the reservoir 3. Interrupt transmission 4. Protect the largest number of susceptibles 	
<p>96. Justify the rationale used when selecting isolation precaution categories</p>	<ol style="list-style-type: none"> 1. Identification of potential patients 2. Handwashing 3. Selection of patient room 4. Ventilation control 5. Protective apparel 6. Care of contaminated materials 7. Disposal of contaminated wastes 8. Personnel assignment 	
<p>97. Discuss areas of controversy associated with the use of universal precautions</p>	<ol style="list-style-type: none"> 1. Poor compliance 2. Decrease in nosocomial infection has not been demonstrated 3. Increased cost of supplies 	

Outcomes	Content	Strategy
98. Define the term Epidemiology	The study of the distribution and determinants of disease and other conditions in human populations: both a body of knowledge and a method of study	1. Lecture 2. Discussion 3. Problem-based case study: Epidemiological data
99. Discuss major characteristics of the field of epidemiology	<ol style="list-style-type: none"> 1. Population-based 2. Describes health-related phenomenon 3. Methodology used widely in all areas of health care 4. A professional discipline 	
100. Justify the major purposes of epidemiology	<ol style="list-style-type: none"> 1. to help understand the cause of disease 2. to be able to plan and evaluate interventions and prevention more effectively 	
101. Compare major approaches to obtaining epidemiologic information	<ol style="list-style-type: none"> 1. Observational studies 2. Experimental studies 	
102. Determine the three factors that interact to cause disease	<ol style="list-style-type: none"> 1. Agent 2. Host 3. Environment 	
103. Define terms used to measure the amount of disease in a population	<ol style="list-style-type: none"> 1. Rate 2. Risk 3. Risk factor 4. Risk factor-specific rate 	

Outcomes	Content	Strategy
<p>104. Assess outcome related events useful in evaluation of an infection control program</p>	<ol style="list-style-type: none"> 1. Changes in nosocomial infection rates 2. Modification of behaviours by health care personnel 3. Learned skill by personnel 4. Spontaneous feedback from personnel 5. Changes in policies and procedures for facility 6. Priority modification for the infection control program 	<ol style="list-style-type: none"> 1. Lecture with Guest Speaker: Epidemiologist 2. Discussion 3. Small-group work
<p>105. Consider interventions useful in an infection control program to effect change</p>	<ol style="list-style-type: none"> 1. In-service education to teach personnel 2. Orientation programs for new personnel 3. Product evaluation and selection for the facility 4. Architectural plan review 5. Antibiotic usage review 6. Participation in quality assurance plan 	
<p>106. Define the term surveillance</p>	<p>Scrutiny of all aspect of the occurrence and spread of disease that are pertinent to effective control</p> <ol style="list-style-type: none"> 1. Collection of data 2. Consolidation of the data 3. Evaluation of the data 4. Dissemination of information to those who need to know 	

Outcomes	Content	Strategy
<p>107. Analyze examples of sources of data for disease surveillance in the Health Care Facility</p>	<ol style="list-style-type: none"> 1. Microbiology data 2. Medical records 3. Admission records 4. Interviews/ward rounds 5. Temperature records 6. Radiographic data 7. Autopsy reports 8. Patient care plans 9. Pharmacy 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Problem-based case study: Sentinel system
<p>108. Describe examples of the uses of the surveillance system</p>	<ol style="list-style-type: none"> 1. To establish data on usual disease experience within the health care setting 2. Identification of problems (sentinel function) 3. Evaluation of control measures to reduce risk and improve compliance 4. Evaluation of policies and procedures 5. Compliance with regulatory agency recommendations 6. Education of personnel 7. Increase visibility of infection control program among hospital personnel 	
<p>109. Assess the elements of a health care facility surveillance system</p>	<ol style="list-style-type: none"> 1. Definitions of the events to be surveyed 2. Systematic collection of relevant data 3. Tabulation and consolidation of the collected data 4. Analysis and interpretation of the data 5. Preparation and dissemination of a report 	

Outcomes	Content	Strategy
<p>110. Differentiate between examples of approaches for surveillance of nosocomial infection and describe each</p>	<ol style="list-style-type: none"> 1. Surveillance of all patients in the facility 2. Periodic surveillance 3. Kardex review surveillance system 4. Prevalence surveys 5. Laboratory based surveillance 6. High risk patient focus 7. Site-focus surveillance 8. Antibiotic monitoring system 	<ol style="list-style-type: none"> 1. Lecture 2. Discussion 3. Problem-based case study: report on outbreak situation
<p>111. Distinguish between endemic and epidemic levels of disease</p>	<p>Endemic: the usual level of disease within a geographical area (hospital)</p> <p>Epidemic: an excess over the expected level of a disease within a geographical area</p>	
<p>112. Describe the primary purpose of a disease outbreak investigation</p>	<p>To identify ways to interrupt further transmission of the disease-causing agent.</p>	
<p>113. Analyze the necessary components of an outbreak investigation</p>	<ol style="list-style-type: none"> 1. Establish of verify diagnosis of reported cases 2. Confirm that an outbreak exists 3. Search for additional cases 4. Characterize the cases by person, place and time 5. Formulate tentative hypothesis 6. Test hypothesis (should explain majority) 7. Consider control measure alternatives; institute 8. Evaluate efficacy of control measures 9. Write report 	

Outcomes	Content	Strategy
<p>114. Describe the consultative process</p>	<p>A cooperative process used for communication values, knowledge or ideas in order to affect a desired outcome Usually informal 1:1 or 1:2 May be done in a formal manner with a large group Can be a learning experience for the consultant</p>	<p>1. Lecture 2. Discussion</p>
<p>115. Discuss aspects of effective consultation</p>	<p>1. A solid knowledge base in infection control 2. A basic understanding of other roles, functions, and procedures 3. Relationship-related abilities <ul style="list-style-type: none"> . objectivity . tolerance of individual differences . elimination of individual differences . patience . sensitivity to the needs of others 4. Consultation may be solicited or unsolicited 5. The consultant's style may directly affect the consultative process and its outcome 6. Situational adaptation is required to create an effective process</p>	
<p>116. Theorize the relationship of consultation and change</p>	<p>1. The liaison is a change agent by virtue of knowledge base 2. Lasting behavioural changes occur only after values and attitudes have been changed 3. Prior to any change, an unfreezing of the status quo must occur. Awareness of an agreement that a problem exists begins the thawing process</p>	

Outcomes	Content	Strategy
<p>117. Discuss learning as a process of growth and change</p> <p>118. Identify reasons indicating why change is necessary</p>	<p>4. Consultation is a means of establishing awareness of a problem</p> <p>5. Consultation alone does not create the anticipated or desired behaviour change if the liaison does not help to:</p> <ul style="list-style-type: none"> . change views . define new expectations . assist in the implementation of interventions . evaluate the results . provide feedback and positive reinforcement <p>6. To be effective and longlasting, behavioural changes instituted by consultation must be positively reinforced and supported by the entire organization. In order for this support to continue, expertise and credibility must be maintained</p> <p>a) A decision to change is necessary before learning can occur</p> <p>b) Usually involves conflict and resistance to giving up comfortable ways of doing things</p> <p>c) An active process directed towards goals</p> <p>1. To solve problems</p> <p>2. To apply principles</p> <p>3. To introduce improvements</p> <p>4. To introduce new ideas</p>	<p>1. Lecture</p> <p>2. Discussion</p> <p>3. Problem-based case study: Planned change</p>

Outomes	Content	Strategy
<p>119. Assess educational priorities of the adult learner</p> <p>120. Compare reasons for participation versus non-participation in adult education</p>	<p>1. Prefers practical knowledge 2. Concentrates on areas of personal experience to improve on what he already knows</p> <p>Reasons for learning:</p> <ul style="list-style-type: none"> a) Improve ability in problem solving b) become better informed c) satisfy curiosity d) advance in present job e) meet job requirements f) meet educational standards g) escape from personal problems <p>Reasons for not learning</p> <p>1. Situational</p> <ul style="list-style-type: none"> a) cost b) not enough time c) home responsibilities d) job responsibilities e) child care not available f) no place to study or practice <p>2. Institutional</p> <ul style="list-style-type: none"> a) courses do not meet needs of the learner b) classes not scheduled conveniently c) too much time required from work d) lack of job promotion <p>3. Attitudinal</p> <ul style="list-style-type: none"> a) lacks perceived need to change b) does not know what to learn c) not confident in ability d) not enough energy e) does not enjoy studying 	<p>1. Lecture 2. Discussion 3. Problem-based case study: Design teaching plan</p>

Outcomes	Content	Strategy
<p>121. Describe major theories which explain motivation as the catalyst for learning</p> <p>122. Describe the characteristics, strengths and limitations of each theory in 118</p> <p>123. Identify four categories that characterize adult learners and discuss each</p>	<p>1. Psychoanalytic School: Freud (1924) 2. Behavioural School: Pavlov (1927) 3. Humanistic School: Rogers (1951) 4. Humanistic-existential School: Maslow (1967) 5. Andragogy vs. Pedagogy: Knowles (1972)</p> <p>1. Self-concept 2. Experience 3. Readiness to learn 4. Orientation to learning</p>	

APPENDIX 1

Phases in Decision Making

- Phase 1.** Recognizing and defining a problem
- uncover unstated, hidden, or suppressed premises that underlay what appears to be the real problem
- Phase 2.** Gathering relevant information
- information should be sufficient, accurate and relevant
- Phase 3.** Generating possible conclusions
- move from data to inferences as the basis for generating possible conclusions
- Phase 4.** Testing possible conclusions
- test possible conclusion for validity, soundness and usefulness; true and relevant premises as the basis for true conclusions help to fulfil these conditions
- Phase 5.** Evaluating conclusions
- to determine what solutions among those tested are workable
- Phase 6.** Reaching decisions
- base a decision both on careful evaluation of the previous steps and the frame of reference, including values, in which the decision will be implemented.

APPENDIX 2

Adult Learning Principles

Learning is a Self Activity of the Learner

Learning requires active participation by the learner. It is important to select instructional methods that actively involve the learner. Learners will learn more, learn faster, and learn longer when they are actively involved in learning

Learning is Intentional

Learning is purposeful and aims at meeting the learner's perceived needs for learning. Learning is most effective when directed at objectives the learner views as meaningful and useful. It is important to indicate how learning will be useful to them in their roles

Learning is an Interactive Process

Hands-on active learning experiences will maximize the amount of learning gained and retained

Learning is a Unitary Process

The learner responds to teaching-learning situations as a whole entity. Learners are influenced by their psychological, physiological and cognitive make-up, as well as by their social and physical environment. It is important to provide for variable interests, opinions, learning styles and pace of instruction as much as possible

Learning is Influenced by the Motivation of Learners

Learning is more readily acquired and retained when learners have strong and sustained desire to learn. Foster intrinsic motivation by providing opportunities for success and by keeping expectations realistic

Learning is Influenced by the Readiness of the Learner

Learner readiness denotes a complex state of physical, psychological and intellectual readiness for learning. Enhance readiness by indicating how useful, meaningful and worthwhile the learning is to that job

Learning is Social

Learning is a shared responsibility of teachers and learners. Enhance the social climate for learning by engaging in informal discussion, communicating effectively, offering criticism constructively, and respecting differences of opinion and exercising patience

Learning Proceeds Best when it is Organized and Clearly Communicated

Organize principles appropriately and have teaching aids ready and functional when they are needed

Learning is Facilitated by Positive and Immediate Feedback

Be generous in dispensing recognition, approval, encouragement and praise. Provide criticism in a constructive and sensitive manner

Learning is Integrated with Knowledge

Learners vary with speed and effectiveness with which they integrate new learning with old knowledge. Explaining relationships and clarifying misconceptions will assist learners in bridging these differences

Learning is Inferred Rather than Directly Observed

Learning is inferred on the basis of a change in behaviour. One cannot assume that learning has occurred unless the observed behaviour demonstrates this.

Learning is Influenced by the Learning Environment

Provide a comfortable, relaxed, non-judgemental atmosphere for learning

Learning is Retainable and Transferable

Retention and transfer of learning to new situations can be increased by early review and frequent summary of the learner material. Emphasis on principles and general concepts facilitates retention and transfer of learning. Point out similarities and differences of new applications in previous learning

APPENDIX 3

Characteristics of Adult Learners

Adult Learners	Implications
have established beliefs and values	must respect and acknowledge the learner's beliefs and values as valid must be aware of own values and beliefs
have a rich reservoir of experience	use this past experience to facilitate new learning
have heterogenous backgrounds	need to be flexible and responsive to the wide variety of learning and cognitive styles
have mixed motives for learning	allow the learner to determine their own immediate learning needs
are busy with many obligations	recognize that learners have other responsibilities plan learning activities that are relevant to the current or future concerns of the learner
are less secure in learning situations	establish a learning environment that is free from threat and that provides support and encouragement
fear inadequacy and failure	provide feedback in a positive manner remain flexible and responsive to the learner's self-concept and self-esteem
don't see teachers as having all the answers	direct learners to appropriate resources collaborate with learners

APPENDIX 4

Dispositions of the ideal critical thinker:

1. **Clarity** - to be clear about the intended meaning of what is communicated
2. **Focus** - to determine and focus on the conclusion or question
3. **Total Situation** - to take into account the total situation
4. **Reasons** - to seek and offer reasons
5. **Well Informed** - to try to be well informed
6. **Alternatives** - to look for alternatives
7. **Precision** - to seek as much precision as the situation warrants
8. **Self-Awareness** - to understand one's own basic beliefs
9. **Open-Mindedness** - to be open-minded about other points of view
10. **Caution** - to withhold judgement if evidence and reasons are insufficient
11. **Non-Scepticism** - to take a position (and change a position) when the evidence and reasons are sufficient
12. **Using One's Abilities** - to use one's critical thinking abilities

Abilities of the Ideal Critical Thinker

(1-5 involve clarification)

1. **Focus** - to identify the focus (issue, question or conclusion)
2. **Argument Analysis** - to analyze arguments
3. **Questions** - to clarify and/or challenge
4. **Definition** - to define and judge definitions, and deal with ambiguities
5. **Assumptions** - to identify unstated assumptions

(6-7 involve the basis for decisions)

6. **Credibility** - to judge the credibility of a source
7. **Observation** - to observe, and judge observation reports

(8-10 involve inference)

8. **Deduction** - to deduce, and judge deductions to (i) generalizations, and (ii) explanatory conclusions
9. **Induction** - to induce, and judge deductions to (i) generalizations, and (ii) explanatory conclusions (including hypotheses)
10. **Value Judgement** - to make and judge value judgements

(11-12 are metacognitive abilities - involving supposition and integration)

11. **Supposition** - to use suppositional thinking - to consider and reason from premises, assumptions, positions, and other propositions with which one disagrees about which one is in doubt; without letting the disagreement or doubt interfere with one's thinking
12. **Integration** - to integrate the other abilities and dispositions in making and defending a decision

(13-16 are auxiliary critical thinking abilities)

13. **Orderly Manner** - to proceed in an orderly fashion:
 - (1) follow problem-solving steps
 - (2) monitor own thinking
 - (3) employ reasonable critical thinking list
14. **Sensitivity** - to be sensitive to the feelings, level of knowledge and degree of sophistication of others
15. **Rhetorical Strategies** - to use appropriate strategies (ie; effective persuasive techniques) in discussion and presentation
16. **"Fallacy Labels"** - to employ and react to "fallacy" labels appropriately

APPENDIX 5

The Role of the Infection Prevention and Control Liaison

- 1. To act as a resource for the staff in your area regarding basic infection prevention and control practices**
- 2. To gain a general understanding of infections and the transmission process**
- 3. To gain knowledge on preventing the transmission of infection through understanding the importance of:**
 - hand washing practices**
 - use of appropriate personal protective equipment**
 - multiple drug resistant organisms**
 - host risk factors**
 - appropriate infection prevention interventions**
 - nutritional assessment and intervention**
 - skin care assessment and appropriate intervention**
 - environmental issues**
- 4. To communicate situations involving the above (#3) to the infection control practitioner on an ongoing basis**
- 5. To assist the staff in your area with proper isolation practices on a continual basis, to ensure that the appropriate precautions are being enforced**
- 6. To assist the infection control practitioner with surveillance of nosocomial infections**

7. To assist nurses in implementing and evaluating wound and skin care programs
8. To assist the infection control practitioner with point prevalence surveys and investigations as required
9. To be responsible for assisting with control measures in the management of an outbreak in your area and reporting the activities that transpired at the monthly infection prevention and control liaison meeting
10. To attend the monthly meeting for the infection and control liaison program
11. To personally develop expertise on the practice of infection prevention and control

APPENDIX 6

The Cognitive Domain

Type of Objective	Learner Behaviour	Action Verbs
Knowledge (remembering)	learner is able to recall or remember information and recognize facts, terminology and rules. learner is not required to understand what was memorized or be able to use the learned facts in a problem-solving situation	count, recall, label, define, identify, name, quote, repeat, record, recite, state, recognize, tabulate, describe, list
Comprehension (understanding)	learner is able to change the form of a communication by translating and rephrasing what has been read or spoken. requires some understanding of facts that have been committed to memory	classify, summarize, compare, paraphrase, contrast, discuss, rephrase, describe, convert, explain, distinguish, extend, estimate, interpret, predict, translate
Application (transferring)	learner is able to apply facts learned to a problem, context or environment that is different from the one in which the information was learned	apply, use, complete, solve, define, operate, demonstrate, employ, draw, examine, illustrate, practice, change, manipulate, modify

Type of Objective	Learner Objective	Action Verbs
<p>Analysis (relating)</p>	<p>learner is able to break a problem down into its component parts and to draw relationships among the parts</p>	<p>analyze, support, point out, detect, separate, explain, break down, relate, distinguish, group, differentiate, transform</p>
<p>Synthesis (creating)</p>	<p>learner is able to put ideas together in creative ways learner combines parts to form a unique or novel solution to a problem</p>	<p>arrange, compare, combine, devise, construct, produce, create, formulate, design, develop, generalize, plan, predict, organize, propose</p>
<p>Evaluation (judging)</p>	<p>learner is able to form judgements and to make decisions using stated criteria learners assess the value of purposes, ideas and materials learners judge the adequacy with which conclusions are supported by data</p>	<p>appraises, concludes, decide, assess, defend, determine, judge, rank, test, rate, recommend, justify, support, criticize</p>

Adapted from: Bloom (1956)

APPENDIX 7

The Affective Domain

Type of Objective	Learner Behaviour	Action Verbs
Receiving	Requires learners to be aware of, or to passively attend to certain phenomenon or stimuli emphasis is on learners becoming aware of some communication or phenomenon from the environment	attend, listen, describe, identify, share, notice, control, look, hear discern, be aware
Responding	requires the learner to comply to preset expectations by attending or reacting to stimuli or phenomenon	comply, follow, volunteer, discuss, practice, play, applaud, obey
Valuing	requires the learner to display behaviour consistent with a single belief or attitude in situations where he or she is not forced or asked to comply	help, debate, act, argue, express, organize, prefer, convince, display
Organization	requires a commitment to a set of values	select, decide, balance, compare, define, formulate, systematize, theorize, abstract
Characterization	requires that all behaviour displayed by the learner be consistent with his or her values	display, require, revise, avoid, arrange, resolve, resist, internalize, exhibit

Adapted from: Bloom (1956)

APPENDIX 8

The Psychomotor Domain

Type of Objective	Learner Behaviour	Action Verbs
Imitation	requires learner to overtly imitate an action that has just been observed	repeat, place, align, follow, hold, grasp, balance
Manipulation	requires learner to perform selected actions from written or verbal directions, without the aid of a visual model or direct observation as in the previous level	repeat, place, align, follow, hold, grasp, group
Precision	requires learner to perform an action independent of either a visual model or a written set of directions a higher level of proficiency in reproducing the action is required	accurately, independently, with control, without error, proficiently
Articulation	requires the learner to display the coordination of a series of related acts by establishing the appropriate sequence and by performing the acts accurately with control as well as speed and timing	harmony, coordination, integration, speed, timing, smoothness, confidence, stability, proportion
Naturalization	requires the learner to exhibit a high level of proficiency in the skill or performance being taught; behaviour becomes routine, automatic and spontaneous	naturally, with ease, routinely, effortless, automatic, professional, with poise, perfection

Adapted from: Bloom (1956)

APPENDIX 9

Guidelines for Small Group Work

The small group should ideally develop in the following areas:

- **Unity:** Strong common purpose and spirit based on real friendships. Group generally sticks together
- **Self-Direction:** Initiation, planning, executions, and evaluation comes from the total group
- **Group Climate:** Members feel free to express themselves, but limit expression to total group welfare
- **Distribution of Leadership:** Leadership is shared by all members of the group
- **Distribution of Responsibility:** Responsibilities are distributed among and carried out by all members
- **Problem Solving:** Good pooling of ideas and orderly thought. Everyone's ideas are used to reach final plan
- **Conflict Resolution:** Group as a whole arrives at a solution that satisfies all members
- **Meets Basic Needs:** Group contributes substantially to the basic needs of all members
- **Variety of Activities:** Great variety of activities. Continually trying out new ones
- **Depth of Activities:** Members find each activity a challenge to develop their abilities
- **Role of the Facilitator:** Facilitator does not direct discussion and/or class activities. Re-focuses group when appropriate

APPENDIX 10

Small Group Evaluation Guide

The following questions are to be completed individually and then discussed briefly. The group process should be kept constructive and brief.

Score each question on a score of one to five, five being the highest score

Were the objectives for this session clearly communicated?	1 2 3 4 5
Were the course objectives met for this session?	1 2 3 4 5
Was the group able to establish a comfortable working atmosphere?	1 2 3 4 5
Was the group open to each others' differences in the area of moral values, beliefs and philosophies?	1 2 3 4 5
Was there discussion in which everyone participated?	1 2 3 4 5
Was the group able to effectively resolve any conflicts that arose?	1 2 3 4 5
Was the group able to communicate effectively and express ideas freely, without feeling manipulated or pressured?	1 2 3 4 5
Did the discussion stay on topic?	1 2 3 4 5
Were the group tasks evenly and fairly distributed?	1 2 3 4 5
Did the leadership role in the group fluctuate evenly between members?	1 2 3 4 5
Did the group make effective use of the talents and experiences of the individual group members?	1 2 3 4 5
Were the assigned tasks completed?	1 2 3 4 5
Comments:	

APPENDIX 11**Problem Based Learning Exercise****The Chain of Infection**

Given a specific disease, describe the steps in the chain of infection
Hepatitis
Acinetobacter

Example: Salmonella

- 1. Causative agent: Salmonella**
 - a. Bacterium
 - b. Characteristics
 - 1) Infective dose 10^6 organisms or greater, if host has normal gastric acidity
 - 2) Viable in the free state (can survive and multiply in reservoirs which provide nutritional support outside the host)

- 2. Reservoirs of the agent, Salmonella**
 - a. Human
 - 1) Carrier
 - 2) Active Case
 - b. Animals
 - 1) Cattle
 - 2) Poultry
 - 3) Reptiles
 - 4) Others

- c. **Environment**
 - 1) Contaminated food products
 - 2) Untreated sewage
 - 3) Biological waste products (fertilizers, bone meal)

3. Portal of exit:

- a. gastrointestinal tract
- b. genitourinary tract

4. Mode of transmission

- a. Direct contact (putting diaper pins in mouth while diapering infant)
- b. Indirect contact
 - 1) Hands of personnel (incontinent patient; tube feeding next patient without washing hands between patients)
 - 2) Contaminated equipment (endoscopy)
- c. Common vehicle (food)

5. Portal of entry:

- a. Gastrointestinal tract

6. Susceptible host:

Anyone, but the:
elderly
very young
those with decreased stomach acidity
are especially susceptible

APPENDIX 12**Laboratory Exercise****Handwashing****Objective:**

To internalize the importance of handwashing, and learn appropriate handwashing technique.

Materials:

1. Glo-Germ liquid
2. Ultraviolet light source
3. Liquid soap
4. Running water
5. Paper towels
6. Medicated Hand cream

Methods:

1. Clarify any portions of the instructions that you do not understand
2. Assemble in groups of 3-4 learners
3. All group members except one should apply 2-3 drops of Glo-germ to their hands and vigorously rub in until dry
4. Proceed to a dark room (no sunlight or artificial light). The group member who has not used Glo-germ should use the ultraviolet light to inspect the hands of the other group members

5.
 - a) One member of the group will proceed with a normal 10 second handwash using soap, water and paper towels
 - b) One member of the group will proceed with a 30 second handwash using soap, water and paper towels
 - c) One member of the group will proceed with a vigorous 30 second handwash cleaning under the nails, and removing all jewellery using soap, water and paper towels

6. Again, use the ultraviolet light to inspect the hands of group members. Also use the light to inspect the sink area and areas of the physical location that participants may have contacted

Summary Questions:

1. What part of the hands did you find to be the most "contaminated" with Glo-germ? Why?
2. What physical locations were most contaminated with Glo-germ as a result of direct or indirect contact? Why?
3. What effect did handwashing have?
4. Was there a difference in the results of the handwashing depending on the length of time used or technique? Comment on this.
5. Was the sink area contaminated with Glo-germ? If so, where? What implications does this have?
6. How did the participants feel when they saw their hands under the ultraviolet light after handwashing?
7. What are the implications of this exercise on transmission of disease?

APPENDIX 13

Journal Guidelines

- ◆ In selecting a format for your journal, remember that your journal will need to be handed in for evaluation.
- ◆ Evaluation of the journal is not based on content, but rather evidence that you have been critically thinking about the subject matter and recording your thoughts and feelings regarding the process
- ◆ The journal is intended as a vehicle for exploring your thoughts generated as a result of class discussion and/or everyday experiences
- ◆ The one good rule for journal keeping is not to think about what someone might think if they read it. Your journal should be considered as an opportunity to connect with your innermost thoughts and feelings, and not as an opportunity to impress the instructor with profound philosophical revelations or facts
- ◆ You are encouraged to write in the journal whenever you have any relevant thought or feelings. This may necessitate keeping a page of your journal handy to write down your thoughts and feelings as they arise. The minimum requirement for journal entries is once a week.
- ◆ Innermost thoughts and feelings will be expressed differently by each person. For example, different people express their feelings through creative writing, poetry, drawing etc. For this reason, no two journals will be alike. You are free to choose any form of expression you wish, as long as you provide evidence of feeling and critical thought on the objectives that you are journaling for.
- ◆ For your last journal entry, discuss what the role of infection control liaison has to offer your personal and professional growth and the challenges and opportunities you see available

APPENDIX 14

Infection Control Questionnaire

	Strongly Disagree			Strongly Agree	
1. work often involves doing things that could lead to an infection problem	1	2	3	4	5
2. I worry about acquiring a multiple resistant organism associated infection at work	1	2	3	4	5
3. Acquiring a multiple resistant organism associated infection would seriously threaten my career as a health care provider	1	2	3	4	5
4. The best way I can protect myself from infections is by wearing gloves	1	2	3	4	5
5. The best way I can protect myself from infections is by handwashing before and after patient contact	1	2	3	4	5
6. Handwashing will protect me from acquiring a multiple resistant organism associated infection	1	2	3	4	5
7. I am safe from infection at work	1	2	3	4	5
8. It is my responsibility to be knowledgeable about occupational hazards	1	2	3	4	5
9. It is harder to protect myself from a multiple resistant organism associated infection than a common infection	1	2	3	4	5

	Strongly Disagree			Strongly Agree	
10. Using gloves is more important when dealing with a patient with a multiple resistant organisms associated infection than other infections	1	2	3	4	5
11. No matter what I do, if I'm going to get an infection, I will	1	2	3	4	5
12. Early nursing assessment of patients at risk of acquiring infections will help stop the spread of infection	1	2	3	4	5
13. It is harder to protect patients from acquiring multiple resistant organism associated infections than other common infections	1	2	3	4	5
14. Patient with multiple resistant organism associated infections have longer hospital stays	1	2	3	4	5
15. I get enough information about infections to work safely	1	2	3	4	5
16. I am safe from infection at work	1	2	3	4	5
17. I get enough information about infection control practices to protect myself	1	2	3	4	5
18. I get enough information about infection control practice to protect my patients	1	2	3	4	5
19. Is there a work colleague to whom you look for information about the latest developments in infection control?					

1. Yes
2. No

20. The following is a list of infection control practices. How effective do you think they are at stopping the spread of infection?

	Ineffective		Don't Know		Very Effective
1. Handwashing	1	2	3	4	5
2. Early Assessment	1	2	3	4	5
3. Masks	1	2	3	4	5
4. Gowns	1	2	3	4	5
5. Gloves	1	2	3	4	5
6. Private Rooms	1	2	3	4	5
7. Medicated Soap	1	2	3	4	5
8. Terminal Cleaning of Room	1	2	3	4	5
9. Equipment Cleaning	1	2	3	4	5

21. When I don't follow isolation precautions for certain procedures, it is because: (you may choose more than one answer)

1. I felt there was no need
2. There were no supplies available
3. Not enough time
4. Other; please specify

22. Which method do you find most effective in acquiring more information about infection control issues and precautions

1. Self-directed learning packages
2. Lectures/Inservices
3. Computer messages
4. Infection Control Manual
5. Rounds
6. Infection Control Practitioner
7. Nurse Educators
8. Other; please specify

23. I would like information about the following:

Thank you very much for your contribution.

A summary of this survey will be made available upon request.

Please make use of the space below for any comments you would like to make.

APPENDIX 15

Final Program Evaluation

Score each question on a scale of one to five, five being the highest:

<p>Were the program objectives clear? Comments:</p>	<p>1 2 3 4 5</p>
<p>Were the program objective realistic for the time frame? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did the program facilitate your critical thinking skills? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did the use of a journal facilitate your critical thinking and reflection skills? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did you find group process evaluation to be beneficial? Comments:</p>	<p>1 2 3 4 5</p>
<p>Were resources available and appropriate to facilitate your learning? Comments:</p>	<p>1 2 3 4 5</p>

<p>Was the educational environment supportive and encouraging? Comments:</p>	<p>1 2 3 4 5</p>
<p>Were adult learning principles evident in the instructional process? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did the instructor provide positive reinforcement and constructive criticism? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did the instructor respond sensitively to student learning needs? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did the instructor effectively facilitate the learner's critical thinking? Comments:</p>	<p>1 2 3 4 5</p>
<p>Did the instructor demonstrate flexibility and openness to new ideas? Comments:</p>	<p>1 2 3 4 5</p>

APPENDIX 16

Infection Control Liaison Program Outcome Variables

Some of the expected outcomes will be:

- 1) earlier identification of risks for acquiring an infection (decrease in ward-specific nosocomial infection rates)**
- 2) decrease in blocked beds for isolation reasons**
- 3) decrease in length of stay for specific diagnosis (ie: patients at risk of pneumonia)**
- 4) decrease in absenteeism for nurses (related to occupationally acquired respiratory and diarrhoeal disease)**
- 5) decrease in workload measures related to isolation requirements**
- 6) increase of reporting infections (enhanced surveillance)**
- 7) earlier initiation of infection control interventions**
- 8) earlier collection of microbiology specimens to identify infections**
- 9) increased autonomy for decision-making related to infection control**
- 10) positive effect of expert "opinion leader" (Lomas, 1993) on the nursing unit**
- 11) decrease demand on infection control practitioner for repeat information**

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