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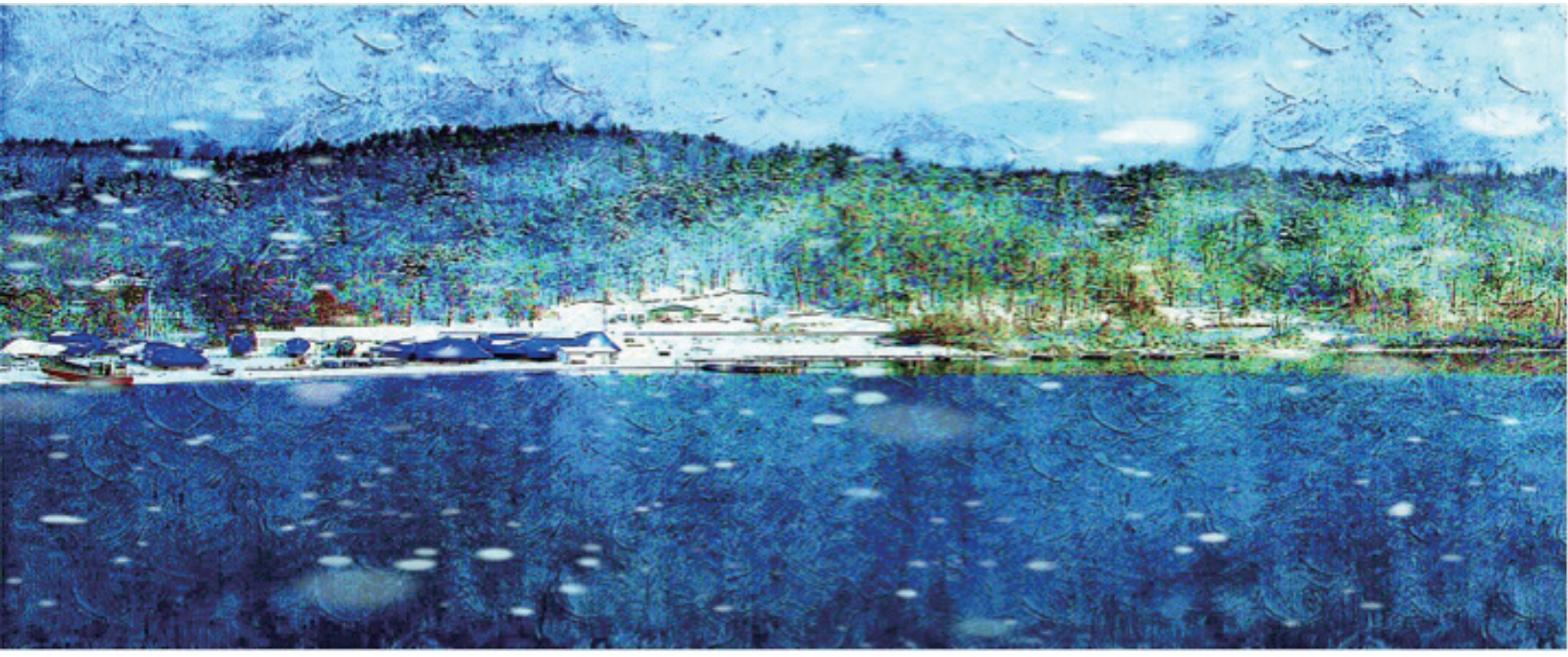

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CONTENTS IN BRIEF

Prohibit Completely Chinese Patent Medicines Sales in the United Kingdom in 2014: Overstrained Decision?

Lei Chen[1*]

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Surprising news from the mass media that Drug Administration of the United Kingdom (UK) is planning to completely prohibit the sales of unlicensed herbal products, mainly Chinese patent medicines (CPMs) in the next year. The main reason of this measure is that CPMs may contain high level of harmful components, such as lead, mercury and arsenic et al. With various forms like exercise, acupuncture, massage and dietary therapy[1], traditional Chinese medicine (TCM) has a history of more than 5,000 years. In ancient times of China, powdered herbs and other ingredients were mixed with a binder (usually honey) to form CPMs. Modern CPMs were normally extracted from herbs by distillation which can preserve the essential ingredients of herbs. In China, the same kind of CPMs sharing the same name and ingredients proportion, and are manufactured under the instructions of China Pharmacopoeia's monograph which is mandated by Chinese law. Based on the accumulation of thousands of years practice and experience, each monograph details the exact type, percentage and cautions of CPMs ingredients. And all products manufactured by practice certified factories must be tested for drug toxicity before entering the market[2]. CPMs should be a good choice for patients in UK or other western countries. It is the allowance issued by Chinese government opened the door for the variation of CPMs formulation. This change, combined with the lack of experimental evidence support, predictably caused mass panic reaction and governmental interventions adoption.

In this particular case that related with human health and welfare, UK government should not be put off so easily by only a slight risk. In the contrary, the government could reverse the tide by jointly establish the manufacture and test standards or regulations with concerned Chinese government department, strengthen scientific research as well as clinically safe medication.

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Punch Biopsy of the Skin

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The clinical video and paper of Jacob Levitt et al[1] showed us the general operation sequence of skin punch biopsy. Many junior doctors may even use them as standard operating procedures. But there are still several points need further discussion.

Firstly, suspected skin cancers is included in the indication. But punch biopsy technique, limited by the equipments, should only be suitable for suspected small skin cancer. For large ones with irregular margin, or grown at a special site, the information provided by it may not be sufficient for preoperative assessment. Also, when the lesion was highly suspected as sclerosing basal cell carcinoma or melanoma[2], the safety of punch biopsy has to be questioned for the impracticability of non-neoplasma touch technology.

Secondly, the author did not further describe the preservation after collection. But for a successful pathology inspection, tissue morphology and antigenicity preservation are important. So for the benefit of the patients, the treatment of specimen should emerge more clearly from this paper.

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Applying Roy Adaptation Model (RAM) in Assessing Health of Patient with Post-operative Coronary Artery Bypass Graft (CABG) Surgery

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Abstract

This paper describes a case study involving a process of theory integration into nursing care in a CABG postoperative care setting. This approach was guided by Roy's adaptation model from the totality paradigm. Following a brief description of Roy's Adaptation Model, a two-day assessment is conducted for a cardiac postoperative patient. Based on the two-day assessment, nursing diagnosis is established and nursing interventions are planned which aim to promote adaptation. Finally, the RAM will be discussed, the advantages and disadvantages of using RAM will be noted.

Keywords RAM, CABG Surgery, nursing care

Description of the Roy Adaptation Model

Roy adaptation model is used for the care of various clients in various settings[1-2]. It focuses on an individual as a biopsychosocial adaptive system. According to Roy nursing is a discipline that emphasizes strengthening, expanding, and improving upon the person's coping abilities for the purpose of enhancing the patient's health. RAM offers guidelines to us in application of nursing process logically[3]. The framework of RAM is assessment, problem identification, goal setting, nursing care planning, implementation and evaluation. According to Roy And Anddrew , RAM is includes five aspects:

Person

The person is defined as a bio-psycho-social being and person interact with a changing environment (stimuli). There are four mode of adaptation:

Physiological mode reflects how the physical needs responds to the stimuli. There are five physiological needs with oxygenation, nutrition, elimination, activity and rest, and protection. Four complex processes are senses, fluid and electrolytes, neurological function, and endocrine function.

Self-concept mode reflects the basic needs of the individual to psychic and spiritual integrity and the way in which an individual senses himself in the society.

Role function mode reflects the sociological role for an individual, in which consisting of a set of expectations of how a person behave in a particular position with the

underlying need of social integrity. It can be classified as primary, secondary and tertiary roles.

Interdependence mode reflects an individual's relational integrity and focuses on the giving and receiving love, respect, and value with the support system and their significant others.

Environment

Environment refers to the stimulating factors, it may affect the integrity of the person, and affect person's health. Stimulating factor is classified into two types; one is internal stimuli within the person, and external stimuli outside the person.

Health

Health is a state that indicates the person can adapt to the change of environment, even the environment equilibrium is disturbed.

Goal of Nursing

In order to help the person achieve adaptation to the change environment stimuli in each of the four adaptive modes, there are physiological, self-concept, role function and interdependence modes.

Nursing activities

It's nursing process through a problem-solving approach. There are six steps to achieve:

1) **First level of assessment** is to identify individual's maladaptive and ineffective behavior relating to the four adaptive modes.
2) **Second level of assessment** is used to identify the stimuli that affect the adaptive or the maladaptive behavior.
3) **Problem identification** is identifying the patient's problem in relation to the four adaptive modes.
4) **Goal setting** is the aim to maintain and enhance individual adaptation, to change ineffective behaviors to adaptive behaviors.
5) **Nursing intervention** is a purposeful planning to change the stimuli and strengthening the coping process.
6) **Evaluation** is used to valuate the effectiveness of the nursing interventions.

Coronary Artery Disease

Definition & Pathology

Coronary artery disease (CAD) is a condition that results from arteriosclerosis. The most frequent type of arteriosclerosis involves the accumulation of fat deposits inside the coronary arteries. This process usually occurs over many years and may not be detected until symptoms occur. These blockages decrease the flow of blood through the coronary arteries and diminish the amount of oxygen and nutrients the heart muscle receives. Therefore, the heart muscle is starved of the oxygen and food necessary to function properly. Development of coronary atherosclerosis or vasospasm may result in myocardial ischemia (MI).

Clinical presentation

Acute MI occurs as a result of prolonged myocardial ischemia that leads to irreversible injury and necrosis. Angina used to describe the chest-pain or discomfort associated with an MI usually lasts longer than 30 minutes and, although occasionally mild and ever absent. Angina is classified into stable angina and unstable angina. Stable angina patients may complain of chest tightness, heaviness, burning, fullness or sharp pain across the center of the chest. This discomfort may also travel to the arms, neck, jaw and back areas. It comes on varied activity or stress and may be relieved by resting and/or nitroglycerin pills. Unstable angina patients may increase in severity or duration, usually have onset at rest or at a low level of exertion, and are unrelieved by the amount of nitroglycerin of rest that had previously relieved the pain. The diagnosis of Acute MI is based on patient history, the presence of ST segment elevation, or Q waves on the 12-lead ECG and serial markers of myocardial necrosis.

Investigation

The diagnosis of CAD is based on patient's medical history, serial ECGs, and serum enzyme changes indicative of cardiac muscle necrosis. Tests used to diagnose CAD include: ECG, stress tests, cardiac catheterization (CC), imaging tests such as chest X-ray, echocardiography, or computed tomography (CT).

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The resting ECG is a record of the electrical activity of the heart, and can demonstrate signs of oxygen starvation of the heart ischemia or heart attack. Exercise treadmill is a useful screening test for patients with a moderate likelihood of significant CAD and a normal resting ECG. Combining Echo with exercise stress testing is also a very accurate technique to detect CAD. CC with angiography is the most accurate test to detect coronary artery narrowing. Blood tests is to measure blood cholesterol, triglycerides, and other substances. If the above investigation shows positive result, CAD can be diagnosed and treatment is required.

Treatment

There is no medical or surgical cure for CAD. Risk factor modification may help control. Patients with CAD can improve their condition by making lifestyle changes such as quitting smoking, losing weight if they are overweight, eating healthy foods, reducing blood cholesterol, exercising regularly, and controlling diabetes and high blood pressure. They should be prescribed medications to treat their condition. The most common drugs are the aspirin, nitrates, beta-blockers and calcium channel blockers. If the patient continues to have angina or significant ischemia is noted while exercise testing, coronary angiography will usually be considered.

Percutaneous coronary intervention (PCI) will be considered for those patients with significant coronary artery narrowing or blockage. PCI is done when a balloon catheter is inflated at the site of coronary blockage, it's followed by placement of stents to increase coronary artery blood flow.

CABG surgery is performed in patients who have failed medical therapy and they are not good candidates for PCI. CABG has been shown to improve long-term survival in patients with significant left main coronary artery narrow, and in patients with significant multiple arteries narrow, especially in those with decreased EF. Patients should stop aspirin and quit smoking for a period before the surgery.

Coronary Artery Bypass Graft (CABG) Surgery

A coronary artery bypass operation is the operative treatment for CAD. In traditional coronary artery bypass surgery, the surgeon makes a median sternotomy, and retracts the rib cage open to expose the heart.Heparin and high potassium cardioplegic solution were given while patient was put on bypass and myocardial protection. The patient is connected to a heart-lung bypass machine (cardiopulmonary bypass pump), that takes over for the heart and lungs to moves carbon dioxide from the blood and replaces it with oxygen, and allows the heart's beating to be stopped, so the surgeon can operate on a still heart. It takes about four hours. The aorta is clamped off for about 60minutes and the body is supported by cardiopulmonary bypass for about 90minutes.

One end of a segment of vein, usually removed from the leg, is anastomosed into the coronary artery below where the blockage occurs and the other end is attached into the aorta. The left internal mammary arteries (LIMA), located on either side of the breastbone, can be used to connected to the LAD artery and/or one of its major branches beyond the blockage . The major advantage of using LIMA is they tend to remain open longer than venous grafts. These grafts by- pass the blockage in the coronary artery and allow improved blood flow and oxygen supply to heart muscle.

CABG is not a cure for coronary artery disease. However, the improved blood supply to the heart muscle should help relieve angina, enable you to be more active and improve the heart's ability to function as a pump.

Nursing focus of post CABG care

When the patient underwent cardiopulmonary bypass, various conditions would have changed. After the surgery, patient will be transferred to ICU for post-operative care, including closely monitoring patient's ECG rhythm, hemodynamic change (BP, HR, RR, SaO_2, body temperature, CVP), fluid balance, electrolytes balance, acid-base balance, coagulation (Hb, clotting, drainage, oozing of wounds) and pain control.

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Reasons of Selecting Roy Adaptation Model

RAM is a systematic and conceptual nursing theory for nurses to assess the patient in bio-psycho-social adaptive aspects. In RAM, it has six steps to guide the nurse to go though the nursing process, and then it divided the adaptation into four modes. Base on the physiological functions for those ICU patient were very critical, the Roy Adaptation Model provides a direction to assess the ICU patient into very detail aspects. Beside, the psyco-social aspects were also stress in RAM.

Case Study

Mr. C, a 67 year-old retired cook man, weight 88kg, is an ex-smoker, quitted for 40 years. He has history of hypertension, and gall stones (with history of cholangitis and cholecystectomy in 4/2007). He had inferior STEMI in 11/2007, thrombolytic therapy was given, reperfusion was done before 24 hours of myocardial infarction (MI). Transthoracic Echocardiogram (Echo) in 10/2008 showed satisfied left ventricle (LV) function, ejection fraction (EF) 44%, no regional wall motion abnormality (RWMA) and normal valves with mild mitral regurgitation (MR). Cardiac catheterization (CC) was done in 10/08, showed mid left anterior descending (LAD) occlude 99%, left circumflex (LCx) artery occlude 60~70%, retrograde from LCx to distal right coronary artery (dRCA), proximal right coronary artery (pRCA) occlude 90%, middle right coronary artery (mRCA) occlude 100%. Also thallium scan reported the viable myocardium noted at anteroseptal, septal and inferoseptal region. Moreover, carotid duplex had no significant extra-cranial carotid artery stenosis, no plaque was present. No aortic calcification was seen in chest X-ray. Mr. C stopped aspirin and finished blood tests of blood cholesterol, triglycerides, and other substances and satisfactory on 8/2009, therefor clinically admintted on 25/8/2009 for CABG on 26/8/ 2009.

Mr. C diagnosed with IHD, was admitted in ICU after CABG at 26/8/2009, CABG with median sternotomy and the endoscopic harvest of left long saphenous vein were done. The graft are LIMA to LAD, SVG to OM1, SVG to dRCA, and then chest closed over two chest drains and 1xA and 1xV pacing wires. The total bypass time was 75min, the cross clamp time was 44min.

The first level assessment that was carried out on the arrival of Mr. C to the ICU allowed nurses to identify the patient's problems in four adaptation modes. In view of Mr. C's critical condition, nurses initially only focused on assessing Mr. C's vital functions including oxygenation and neurological status. After stabilizing Mr. C's cardio-respiratory function, the rest of the assessment continued. The second level assessment that was carried out within 8 hours upon Mr. C's arrival, allowed nurses to find out the stimuli (factors) contributing to the identified problems. It should be noted that the patient's problem can be due to one or more stimuli.

After performing the nursing assessment, a number of problems were identified. This included:

1.Pulmonary dysfunction
2.Hypotension
3.Hypothermia
4.Potential for dysrhythmias
5.Potential for bleeding
6.Limited physical mobility
7.Anxiety

Based on the findings of the nursing assessments, a nursing care plan was developed below.

Problem 1:

Pulmonary dysfunction was caused by the effects of anaesthesia, cardiopulmonary bypass, and surgical techniques.

Goal setting: To protect patient's airway for ventilation and early extubate after off sedation.

Interventions:

1.Ensure and record the ventilator settings as prescribed.

Determined the ventilator effectiveness by monitoring saturation, tidal volume, and ABG result.

2.Provide adequate analgesic to promote increased activity without inducing respiratory depression. Maintain mechanical ventilation as needed until criteria for extubation are met.

3.Help Mr. C sit up, do suction as need to maintain air way, instruct he to do deep breath and effective cough, and arrange physiotherapist for recovery therapy.

Evaluation:

1.Mr. C was extubated after off sedation for 12 hours, and able to cough up moderate white phlegm.

2.Mr. C was stable with 8L O_2 mask after extubated.

Problem 2:

Hypotension related to cardiopulmonary bypass during operation.

Goal setting: To maintain normal BP and hemodynamic stable.

Interventions:

1.Monitor CVP, urine output and maintain preload with fluids as needed.

2.Monitor BP, MAP, heart rate, to detect durg effect and hypertension.

3.Administer TGN infusion as prescribed to reduce after load, decrease workload of the heart and maintain graft pateny.

4.Administer dopamin and adrenaline infusion to maintain BP, monitor the effect and side effect.

5.Carry out all prescribed treatment properly.(e.g. IV fluid infusion 1/2:1/2 + KCL20mg solution 80ml/hr.)

Evaluation:

1.Mr. C's blood pressure was around at 140/65mmHg and MAP around 75mmHg.

2.Dopamine and Adrenaline IV infusion were Stopped after BP was stable at the midnight of 26/07.

Problem 3:

Hypothermia due to the effects of cardiopulmonary bypass and operation.

Goal setting: To maintain an normal body temperature.

Interventions:

1.Monitor body temperature closely.

2.Provide warm blankets.

3.Avoid overwarming.

Evaluation: Mr. C was warmed up at around 36.8~37℃.

Problem 4:

Potential for dysrhythmias can due to history of IHD, myocardial irritability during surgery, electrolyte imbalances.

Goal setting: Reduce the potential for dysrhythmias.

Interventions:

1.Closely monitor ECG wave form, including the elevation of ST segment, and peak T wave, detect pacer and dysrhythmias.

2.Attach epicardial pacing wires to pulse generator.

3.Closely monitor electrolyte, maintain electrolyte and I/O in balances.

4.Maintain graft patency by monitoring ST segment elevation or any premature ventricular complex, intravenous nitroglycerin and early administration of aspirin to inhibit platelet aggregation.

5.Administer prophylactic beta-blockers or other antiarrhythmic as ordered.

Evaluation:

1.Without any dysrhythmia occurrence, kept on monitoring. ECG showed T wave normal without ST segment elevation at 27/08.

2.I/O and Electrolyte were all in balance at 27/08. Urine output decreased from 2.28 ml/kg/hr to 0.56ml/kg/hr.

3.GTN was put on IV infusion around 0.5mg/hr to 1.0mg/hr.

4.Mr. C was administrated aspirin as prescribed in the morning of 27/08.

Problem 5:

Potential for bleeding.

Goal setting: To detect and reduce bleeding.

Interventions:

1.Keep the incision clean and dry, detect wound bleeding, and monitor the volume, color, and quality of the drainage.

2.Maintain patency of chest tubes, detect bleeding,

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and cardiac temponade.
3.The drains should be fixtured and placed well.
4.Administer transemin as ordered.
5.Monitor the Hct/Hb, aPTT, and platelets.

Evaluation:

1.Platelets, aPTT, haemoglobin, HCT are normal. PT was normal at 27/08. INR decreased from1.25 to 1.19 at 27/08.
2.Trains are placed well and no fresh oozing, with minimal drainage.
3.Transemin IV infusion at 500mg/hr.

Problem 6:

Limited physical mobility due to wound pain and sedation.

Goal setting: Regain mobilization after off sedation and patient can have maximum self-care in bed.

Interventions:

1.Monitor Mr. C's conscious level continuously.
2.Titrate off the sedation and as prescribed. Administer pain killer (IV morphine) if need. Monitor the effect and side effect.
3.Monitor Mr. C's limbs power after off sedation.
4.Monitor the serum phosphate, administer sodium phosphate as
5.Give necessary assistance if need and encourage mobilization when awake.

Evaluation:

1.Mr. C claims pain can relief after morphine injection.
2.Mr. C can sit up in bed after operation for 12 hours.
3.Mr. C can feed himself after operation for 15 hours.
4.Mr. C's serum phosphate increase to normal, after sodium phosphate infusion as prescribed.

Problem 7:

Anxiety related to Mr. C's worry about the surgical treatment and disease prognosis.

Goal setting: Reduce the anxiety in two days.

Interventions:

1.Encourage expression of the feeling. Acknowledge awareness of patient's anxiety.
2.Explain the procedures and reason of being in ICU by simple words and brief statements.
3.Arrange meeting with surgeon for patient and his family.
4.Maintain a clean and quiet place for rest, stay with patient if it appears necessary.

Evaluation:

Mr. C showed less anxiety and is less worried than before.

The plan included problem identification, goal setting, intervention, and evaluation. Based on the data collected during the 1st and 2nd level assessment, the patient's nursing diagnosis could be identified. The RAM allowed nurses to use the NANDA, Roy's typology, or just simply to state the problems. This made the documentation simply to state the problems. As for the goal setting, the RAM allowed nurse to set short-term goal might be more realistic, because the patient's condition was changing all the time. So the master care plan should only serve as a guide to nursing care delivery, nurse should continue to assess the patient's condition and evaluate the nursing care plan on shift-to-shift bases. Intervention was simply to carry out what had been planned; and evaluation would be carried out by assessing the patient's outcome behaviors.

Subsequent Patient Progress

Health assessment and nursing care plan were carried out on the first day of ICU admission. The 1st level health assessment helped nurse to identify Mr. C's physiological as well as psychosocial problems through the four adaptation modes. The 2nd level assessment helped nurses to differentiate the different factors that contributed to Mr. C's problems. Seven problems were identified, and an initial nursing care plan was developed. The plan covered Mr. C's problems, the nursing goal, intervention and evaluation. Health assessment served as a tool based on which Mr. C's problems could be identified rapidly and systematically; whereas the nursing care plan served as a direction based on which nurses knew how to deliver specific care to meet the holistic needs of Mr. C.

It was noted that the health assessment and planning of nursing care should not be an one-off practice. It had to be

carried out continuously. Nurse needed to perform health assessments of Mr. C at regular intervals (say, in every nursing shift or whenever Mr. C's condition changed). The nursing care plan was modified as needed. Before extubation, assessing the patient's physiological function was not difficult, but assessing the psychological state of a ventilated patient did require some skills. Nurses had to use various means to communicate with the patient. Other than observing Mr. C's body gestures, nurses needed to communicate with Mr. C by means of pencil and paper.

Mr. C stayed in the ICU for nearly 3 days. During his stay, Mr. C was provide thermal treatment at the first of arrival to ICU, and also received mechanical ventilation after off sedation for 6 hours. He was put on sit-up position when the sedation was reduced gradually. After weaned off the ventilator, he was extubated with O_2 mask, and able to cough up moderate white phlegm. The vital signs, central venous pressure (CVP), urine output, air blood gas (ABG), blood clotting were monitored. Tramsmin was used to relieve pain. Nitroglycerin was administered as prescribed to reduce after load, decrease workload of the heart and maintain graft patency. Adrenaline and Dopamine were administered to maintain blood pressure (BP). ECG wave form and wound drainage were closely monitored. Finally, Mr. C's clinical parameters were stable after stopped Dopamine and Adrenaline IV infusion (an improvement in SpO_2 with 2L O_2 mask, ABG, ECG, no fresh oozing with minimal drainage). Finally he was transferred to a cardiac ward for subsequent management and care.

Using the Roy adaptation model to guide the health assessment of Mr. C

Table 1: Nursing assessment based on Roy Adaptation model on admission to ICU

Physiological Mode of Adaptation	1 st level assessment	2nd level assessment F=focal stimuli; C=Contextual stimuli; R=Residual stimuli
Physiological Mode Oxygenation	Mr. C is put on a ventilator with ASV mode and FiO_2 1.0. PEEP at 5cmH_2O. Pulse oximeter shows SpO_2 at 99%. Cheat sound is clear. Heart sound dual, no murmur. JVP is not elevated. ECG monitor shows: heart rate 100bpm, regular rhythm, BP 98/50mmHg, and MAP at 62mmHg. Peak T wave with ST segment elevation 2 mm at V_2-V_3. Mr. C's PT is prolonged (12.3seconds), with prolonged INR(1.25). Platelets, aPTT, hemoglobin, and HCT are normal. Mr. C is now put on Tramsmin IV infusion at 500mg/hr, GTN IV infusion at 0.5mg/hr, Dopamine IV infusionat12mg/hr, Adrenaline IV infusion at 15mg/hr.	Air way problem due to sedation and anesthetic effect which suppressed respiratory system.(F) Hypotension is cause by the anesthetic effect and also relate to the history of IHD. (F) Elevated ST segment can due to myocardial injured during operation. (F) Dysfunction of blood coagulation due to using of heparin during operation.(F)
Neurological Function	Low dose sedation is put on IV infusion. Mr. C's GCS is E_1VTM_1; pupils equal and sluggishly react to light.	Due to the problem of anesthetic and sedation effect. (F)
Fluid &electrolytes	Fluid balance is normal. Serum sodium and potassium are both normal.CVP: 3mmHg, Chest drain: drain-A is 110ml, drain-B is 40ml.	No significant problem was identified.
Nutrition	Mr. C cannot eat food orally. Serum phosphate is low (0.66mmol/L). Total Protein is normal. Blood test result of pre-operation showed serum lipids and lipoproteins were normal.	Decrease phosphate due to fluid shifts and fasting. (C)

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Elimination	Urethral catheter was inserted with large amount of clear urine output (2.28 ml/kg/hr), with high Creatinine (122μmol/L) and Urea (9.5mmol/L). Without diarrhea and constipation.	Increased urine output due to diuresis was given at the end of the operation.(F) Renal dysfunction due to low perfusion of kidney during cardiopulmonary bypass. (C) Indwelling urinary catheter related to general anesthesia during surgery.
Sense Communication Pain	After intubation, he can't talk. Mr. C is under sedation, can't assess pain.	Not applicable.
Protection Skin Integrity Immune function	Mr. C's Median sternum wound is covered with dressing. Mr. C is normo-thermic with an increase in WCC(17.7 10*9/L).	Wounds and inflammatory response are caused by the invasive operation.(F)
Exercise and rest	Mr. C is Resting under sedation.	Impaired physical mobility due to under sedation.(F)
Endocrine function	Mr. C's Histix is normal.	No significant problem was identified.
Physiological Mode of Adaptation	**1 st level assessment**	**2nd level assessment**
Self concept mode Personal self Physical self	Can't assess due to sedation.	Not applicable.
Role function mode Primary role Secondary self Tertiary role	Can't assess due to sedation	Not applicable.
Interdependence	Can't assess due to sedation.	Not applicable.

Advantages and Disadvantages of RAM

The strength of RAM is a systematic and conceptual nursing theory for nurses to assess the patient in bio-psycho-social adaptive aspects. The physiological mode of adaptation can facilitate in assessment on patient who is critically ill, It guided the assessment systematically level of adaptation and facilitated the management the stimuli to promote patient's adaptation. It allows different health care professionals to access and communicate efficiently.

Although this model is broad in scope, there're still some limitations of the model. The limitations, include:

- The terms of RAM are quite complex, nurse need to be trained to use it.
- The judgment of behavior as adaptive or maladaptive will be influenced by the value system of the nurse assessing the client.
- The term "adaptation" generally does not convey a meaning of growth as intended in the model[4].

Conclusion

The Roy Adaptation Model (RAM) is a systematic and conceptual nursing theory for nurses to assess the patient in bio-psycho-social adaptive aspects. By using a nursing model as a framework to guide the nursing practice will make the direction of care clearer. It enhances nursing care into very detail in ICU. According to this article, it describes how the RAM was used to form a holistic framework for assessing the health problems of a post- op CABG surgery in the ICU and to guide the development of a specific plan of care to meet his bio-psychosocial needs. The ability to perform health assessments to identify the problems of our patients is important characteristic of an advanced nursing practice. CABG Surgery is becoming more common; the requirement of the post-op care is getting higher too. Implementing this model in practice is perceived as having a positive impact on personal sense of nurses as well as on the image of nursing profession as a whole. Using RAM to guide the health assessment and care delivery tin a technologically overwhelming unit may help nurses to deliver better care to the patients.

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The Cryopreservation and Recovery of Cells

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Abstract

The cryopreservation and recovery of cells is an important technology for cell culture, which is mainly applied to (1) biological breed conservation; (2) cytological analysis; and (3) serial sub-cultivation. There are also many descriptions on this technology, but in real practice there are often many problems like lower survival rates and bad condition after the recovery of cells. In addition to summarizing the regular methods for the recovery and cryopreservation of cells, some technical issues about this technology will also be discussed to increase the rate of survival after the recovery of the cells.

Keywords cells, cryopreservation, recovery

Background

The technology of cell culture began from the beginning of the 20th century [1, 2], and it is now one of the commonly used technologies in the field. A cell outside the body loses the neuro-humoral regulation and the cellular interaction, and thus live in a relatively stable environment, which lacks the necessary dynamic balance, however, it still can be characterized and studied. During the long-term process of cell cultivation, conditions like microbial contamination or genotype changes may appear, which would lead to the loss of good characterized cell lines. In order to prevent the loss of these cells, they may be stored at very low temperature through quick cryopreservation and almost for infinite period.

Under the condition of the very low temperature of -70℃, the biochemical reactions inside the cells is extremely slow and even stops. Therefore, appropriate methods should be adopted to stop and stabilize the cellular life activity at a certain phase and thus avoid aging and death. When appropriate methods are applied to recover the cryopreserved materials back to room temperature, the internal biochemical reaction will be restored back to normal.

Methods

i.Theory

When cells are cryopreserved directly without changing any conditions, the water within the cells and the extracellular matrix crystallize , which would result in mechanical damages, electrolyte imbalance, changes of osmotic pressure, dehydration, pH value changes, and the albuminous degeneration, etc., and eventually the death of the cells. If protective agent could be added into the nutrient solution, the freezing point can be reduced. The condition of slow freezing could drive the intracellular water out of the cell before freezing. Preservation at low temperature below -130℃ would reduce the formation of icy crystals. The recovery of cells should be done very quickly so as to let it quickly pass the range of -5~0℃ when the cells are more prone to damage, so that the cells could still grow without large detriment to their vitality. The fundamental principle of the cryopreservation and recovery is to freeze slowly but thaw quickly. It has been proven that in this way, the vitality of the cells could be preserved to a maximum degree. Currently, cryopreservation mainly takes glycerol or dimethyl sulfoxide as the protective agent because these two kinds of substances could raise the permeability of cell membrane to water. In addition, slow freezing could drive the intracellular water out of the cell to reduce the formation of icy crystals within the cell and then mitigate cell damage caused by the icy crystals. Recovery of cells should adopt the method of quick thawing to guarantee that the crystals outside of the cells could thaw within a very short time and to prevent slow thawing from making water enter into the cells to recrystallize again and thus damage the cells.

ii.Agents and equipment

Equipment:

Nitrogen canister, microtubes (special microtubes for plastic screw), centrifuge tube, suckers, hydroextractor, and 37℃ thermostatic water bath.

Agent: 0.25% pancreatin, substrate, substrate containing protective agent (that is, cryopreservation medium)

iii.Operating procedures

1.Cryopreservation

1)Substrate of half or total quantity should be used one day before the freezing so as to observe the status of the growth of the cells and the cells had better be in the period of logarithmic growth.

2)Preparation of the cryopreservation solution (done before utilization): Put DMSO to fresh substrate

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and make the final concentration as 5-10%. Mix it evenly and put it at room temperature ready for use. It should be avoided to prepare temporarily, which would produce heat and thus kill the cells.

3)Digestion of the cells: To collect cell suspensions into centrifuge tubes and centrifuge at 1000rpm for ten minutes, then get rid of the supernate. Precipitate, culture with protective solution, count, and adjust to be about 5×106/ml.

4)Reduction of the temperature according to the following sequence: room temperature→ 4℃ (for 20 minutes) → refrigerator freezer (for 30 minutes) → low temperature refrigerator (at -30℃ for one hour)→gaseous nitrogen (for 30 minutes)→liquid nitrogen 2.6. put in the refrigerator at super low temperature of -80℃ for overnight.

5)Storage in liquid nitrogen tanks for long time. Good record of the cryopreservation simultaneously on both the notebooks of themselves and the Record Book on Cryopreservation.

2.Recovery

1)The operator should put on protective mask and gloves to prevent from being hurt by the detonation of cryovials.

2)The cryovials should be taken out from the container of liquid nitrogen or dry ice and the caps should be checked to see whether they have been screwed tightly because at that time the caps are easy to loose and drop due to the process of thermal expansion.

3)The fresh substrate should be put in the water sink at 37℃ for temperature recovery, after which 70% alcohol should be sprayed and for scrubbing, then it should be moved to sterile operating platform.

4)Take out of the cryovial and then immediately put into the 37℃ water tank for quick thawing. Slightly shake the cryovial so as to make it thawed within one minute. Scrub the outside of the cryo tube with 70% alcohol and then move it into sterile operating platform.

5)Take out of the thawed cell suspension solution and then slowly add into a culture container with substrate (the proportion of attenuation is 1:10~1:15) to even mixed status. Then put it into the CO_2 incubator for culture. Take 0.1ml of thawed cell suspension solution for survival test.

6)Whether or not the cryoprotectant (such as DMSO or glycerol) should be eliminated immediately after the thawing depends on the types of the cells. Generally speaking, most of them needs not get rid of the cryoprotectant immediately. If it should be done so, then the thawed cell suspension solution should be put into the centrifuge tube containing 5-10ml substrate for centrifuge at 1000rpm for 5 minutes, after which the supernate should be removed and new substrate should be added so as to be mixed evenly and then put into the CO_2 incubator for culture.

7)If it needs not to remove the cryoprotectant at once, then the substrate should be substituted after the date of the thawing of the culture.

Discussion

1.The commonly used low temperature protectant is DMSO,which is a kind of permeating agent and able to quickly penetrate into the cell, enhance the permeability of the cell membrane to water, reduce the freezing point, delay the process of freezing, render the water within the cell to get out of the cell before the freezing, form ice crystals outside of the cell, and reduce the ice crystals within the cell so as to mitigate the damage incurred by ice crystals to the cell. No need to conduct autoclaving before using DMSO because it has the sterile effect itself. Autoclaving could damage its molecular structure so that the effect of protection on the freezing would be reduced. At room temperature DMSO is harmful to human body, so gloves should better be put on during the preparation implementation. The mixing of DMSO should be quick because DMSO is toxic to cells, after which it should be cryopreserved as soon as possible. It should be reminded that it must be

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mixed to even after adding in of the cryopreservation solution so as to prevent the depositing of DMSO. As to the proportion of the cryopreservation solution, the substrate:serum:DMSO should be 7:2:1. There are also some one increasing the proportion of the serum and some even raise it to 90%. The concrete concentration depends on the experience, but a lot of people think that it would be better with bigger content of calf serum.

2. The number of cells within the cryovial usually should be at least 106-7/mL.
3. Generally speaking, 1.5ml cryopreservation solution filled with evenly suspended cells could be put into the cryovial and some people would like to cryopreserve 1-1.5 ml cryopreservation solution, which is actually not good. The reason lies in that the cryopreservation of the solution needs some time and if during this period the cryovial is tilted then the solution will flow to the orifice, thus resulting in pollution in subsequent operation. It is suggested that the amount be among 0.5-1mL is enough.
4. Except for some few cells that have been indicated to be sensitive to DMSO, most of the cell lines (including suspending cells) should be directly put into the angle bottle containing 10-15ml fresh culture after thawing and then on the following day it should be changed to fresh culture so as to eliminate DMSO. Therefore, the problem that most of the cells after thawing are unable to grow or attach would be avoided. In addition, some foreign institutions and universities all suggest not adopting the method of centrifuge because they think centrifuge could cause more harm to cell than what could be done by DMSO. If immediate elimination is needed, then the thawed cell suspension solution should be added into a centrifuge tube containing 5-10 mL culture for centrifuge at 1,000 rpm for five minutes, after which the supernate should be removed, new substrate should be added and mixed to an even degree, then it should be put into the CO_2 incubator for culture.
5. Fresh culture solution should be changed one day before the cryopreservation of the cells, and this is very important! Otherwise the cell will not have a good status in the old culture solution and it will be difficult for it to grow after the recovery through strong stimulation of cryopreservation.

References

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