IJIRR

International Journal of Information Research and Review
Vol. 04, Issue, 03, pp.3860-3864, March, 2017

Research Article

ACTIONS TO REDUCE THE IMPACT OF SEPSIS BY CENTRAL VENOUS CATHETERISM

[1]Gilberto Oscar Caballero Álvarez, [*2]Daylin Fleitas Gutiérrez, [3]Edwin Alejandro Llorente Zambrano, [4]José Luis Quesada Suarez and [5]Ángela Lourdes Pico Pico

[1]Dr en Medicina, Esp. Primero Grado en Medicina Interna, Mg. en Urgencias Médicas en Atención Primaria en Salud, Docente Universidad Técnica de Manabí, Ecuador
[2]Lcda. Microbiología, Mg. Nutrición infantil, Docente Universidad Laica Eloy Alfaro de Manabí, Líder del área Microbiología Lab. Santa Rita, S.A. Ecuador
[3]Lcdo. en Ciencias de la Educación mención Ingles, Mg. en Enseñanza del idioma Ingles, Docente Universidad Laica Eloy Alfaro de Manabí, Ecuador
[4]Dr. en Medicina, Esp. Primero Grado en Neumología, Docente Universidad Técnica de Manabí, Ecuador
[5]Dra. en Medicina y Cirugía, Mg en Investigación Clínica y epidemiológica, Docente Universidad Laica Eloy Alfaro de Manabí, Ecuador

ARTICLE INFO

Article History:

Received 20th December, 2016
Received in revised form
07th January, 2017
Accepted 21st Febuary, 2017
Published online 30th March, 2017

Keywords:

Sepsis,
Venous Approach,
Catheter-Associated Infection,
Blood Cultures.

ABSTRACT

Currently there is a growth in the use of extravascular catheter as a procedure worldwide, mainly due to the expansion of work in critical care. Cuba does not escape to such a scale???? In Cuba an observational, descriptive, cross-sectional study of the procedure in use has been conducted at the Intensive Care Unit of the Dr. Mario Muñoz Monroy University Hospital in Colón, Matanzas. The investigation, which aimed to identify factors that could reduce the incidence of sepsis secondary during this procedure. ran from January to December 2007 and focused on 143 patients, predominantly aged 45 to 70, requiring a deep venous approach. The most frequent causes that had led to the use of the procedure here was the administration of drugs and parenteral solutions while the largest number of patients used central venous catheterization for between 7 and 10 days. The most frequent complication was procedural sepsis from which thirty patients died. The Chi Square of independence methodology was applied to test the hypothesis that no differences existed across the proposed qualitative variables of age, causes of deep venous approach, time of use, more frequent complications and state at discharge.

INTRODUCTION

Percutaneous central venous catheterization (CVC) is the most frequent invasive procedure used in critical care units. The need to work with a deep vein emerges for several reasons, to provide fluids and drugs irrespective of peripheral venous capital use, to administer vasoactive drugs or irritative solutions, for parenteral nutrition with hyperosmolar solutions, to implant pacemakers, for the monitoring of central venous pressure, invasive hemodynamic monitoring with Swan-Ganz catheter, cerebral metabolic monitoring and extrarenal clearance techniques. The deep veins addressed are the internal jugular, the subclavias and, less frequently, the femoral ones. (Amin *et al*., 2004).

****Corresponding author: Daylin Fleitas Gutiérrez,***
[5]Dra. en Medicina y Cirugía, Mg en Investigación Clínica y epidemiológica, Docente Universidad Laica Eloy Alfaro de Manabí, Ecuador.

This procedure violates the defensive barriers of the body and requires some training as complications can appear both at the time of insertion and during subsequent care management, thus impacting on the recovery of patients (Agee, 2006). Complications derived from CVC are linked to the catheterization technique, the pathway chosen, the patient's disease, the environment where it is performed, the length of stay, as well as the experience of the staff performing it (Álvaro Pascual, 2004). More than 15% of patients undergo complications. Firstly The mechanics???? are reported between 5 and 19% and within these arterial puncture, hematoma and pneumothorax, are the most frequent during insertion whilst the infectious complications related to the catheter originate from different mechanisms???, infection of the entrance site. Secondly, in between 5 and 26% of cases complications occur through migration of the pathogen along the surface of the catheter or by contamination of the light and hematogenous infection with the original germ of the catheter.

These complications produce an increase in morbidity, mortality, stay and costs (Procedimientos en Microbiología Clínica, ?; Ariza *et al*., 2003; Álvarez- Lerma *et al*., 2007). The aforementioned leads to the catheter infection becoming a problem of the first order in usual care activity (Caballero López, 1988). The definition of "Sepsis or CVC-related infection" has long been a source of controversy and confusion when comparing results across hospital settings. For some authors the term encompasses any infection that is generated from the installation and permanence of a CVC, from a localized infection at the point of insertion to septicemia. While for others, especially those of an Anglo-Saxon background, the term CVS-related sepsis refers to a clinical picture characterized by fever and chills which occur in a patient with no other apparent septic focus and who usually gives in??? with catheter removal (Dee Boyd *et al*., 2004; Ermakov, 2005; Ariza, 2003).

Problems in defining terms were largely overcome after the Centers for Disease Control (CCE) in Atlanta, United States of America, standardized the criteria for defining the six types of CVC-associated infections. The meticulous care of the central venous catheter before, during and after its insertion results in a decrease in the incidence of both infectious and mechanical??? complications. The development of strict CVC management protocols are responsible for these and reductions in morbidity (Curly; Ariza, 2005) Taking into account that the University hospital Colón, Matanzas covers four Municipal Intensive Areas, and provides the first port of call for patients in need of this procedure and after the analysis performed, the assessment in the medical practice formula for this research the Next scientific problem????: How to contribute to a decrease in incidence of sepsis related to central venous catheterization and to ensure the actions required are reflected in care plans for patients

MATERIALS AND METHODS

An action research project was carried out in the Intensive Care Unit of the Dr. "Mario Muñoz Monroy" Hospital, in Colón, from January 1 to December 31, 2007 with patients who required the use of central venous catheterization at some time during their stay. An observational, descriptive cross-sectional study design was used The universe consisted of 143 patients, coinciding this value with the sample. ????. The Chi square test of independence was used to test the hypothesis that no differences existed across the proposed qualitative variables. Data from clinical histories was collected, including continuous morbidity records and death certificates, and processed using Excel. Established bioethical requirements were accounted for, especially in the management of selected clinical histories, to safeguard confidentiality

RESULTS AND DISCUSSION

Central venous catheterization (CVC) was performed on a total of 143 patients. Internal Yugular?? was mostly used, accounting for 69.2% of the sample, Subclavia at 26.6% and Femoral on only 4.2% of the patients. Age wise the largest sampled group were 36-70, with only 5.6% of the total being aged less than 18. Statistically significant???. The main cause of CVC in 100% of cases was the administration of drugs and parenteral solutions. The procedure for invasive monitoring was used in 64.3% and parenteral nutrition in 31.4% of the total CVCs performed. In the 31.4% of the cases studied, the CVC was used in the sampling for complementary. Statistically significant.??? 76.2% AVP was maintained for between 7 - 10 days in 76.2% of cases and the most used technique was the Internal Yugular represented by the 58.7%.????-see above The length of time that-what? was continued in decreasing order was 1 - 6 days, which represented 16.7% of?. The most used CVC technique was the Subclavia representing 9.7% of?.

The time period of? was less than 10 days, representing 6.9% where the use of the internal jugular was more frequent in 3.4% of caes. There were complications related to the use of central venous catheterization in 21.6% of the cases. Sepsis predominated as a more frequent complication related??? to the use of the deep venous approach, in 11.8% of the patients studied. Everything in blue requires greater clarity which could be achieved, for example, by attention to paragraphing 20.9% of the total number of patients studied died, 1.3% of them with CVC-related sepsis, compared to 10.4% of the septic patients (CPS) who died alive???. The predominant age group was between 18 to 44 and the most used CVC technique was the Internal Yugular-see above, reflecting theoretical constructs relevant to the study (Ramanathan, 2005). Ruiz de la Fuente generated similar results, proposing the catheterization of the internal jugular vein in the units of attention to the serious patient as of choice with respect to other types of deep venous canalization??-is this necessary, if so it´s really unclear! because it is a vein of great caliber and relatively easy to locate even in cases of shock, thus constituting a preferred route (Olaechea *et al*., 2004). According to these researchers, this technique does not compromise cardiopulmonary resuscitation maneuvers and has less incidence in respiratory, cardiac and neurological complications. With respect to age, these results are explained by the high incidence of severe morbidity in the group studied.

In many instances to benefit from the advantages of deep venous catheterization provides, since it allows the administration of incompatible drugs through a catheter, the administration of irritant, caustic or hypertonic solutions, hemodynamic monitoring, insertion of transvenous pacemaker catheters, support of rapid infusions of fluids in resuscitation, are ways that, once installed, avoid manipulation of the patient before??? inability to cannulate peripheral veins. (Four.Five).
The main cause driving the use of CVC was the administration of drugs and fluids, including those given for cerebral cardiopulmonary resuscitation. Several studies corroborate these results reflecting that this procedure represents an indispensable and vital indication (Agee, 1992), by peripheral route, the Internal Jugular being used more frequently for this purpose.??? It-what? is considered an important finding as it supports invasive monitoring, challenging current thinking, knowledge and therapeutic principles based on non-invasiveness and progressively faster??. (Luque Gómez *et al*., 2006; Safdar *et al*., 2005; León). Other authors have suggested the use of the procedure in patients with chronic diseases and those requiring repeated blood withdrawals, prolonged parenteral nutrition, chemotherapy cycles, blood products and drugs, as having a central venous line facilitates or improves their quality of life (Conferencia de consenso SEIMC-SEMICYUC , 2007; Catton *et al*., 2005).

The following variables were studied

Variable.	Type of Variable.	Category.	Description.
Age	Discrete quantitative	< 18 years old 18 – 44 years old 45 – 70 years old >70 years old	According to age
Causes of Deep Vascular Access	Nominal qualitative	- Administration of drugs and parenteral solutions - Complementary sample. - Administration of parenteral nutrition. - Invasive monitoring.	According to need
Time of use of Deep Vascular Access	Nominal qualitative	<1 day 1-6 days 7 - 10 days >10 days	Consderation of timing of use of deep vascular access
Complications	Nominal qualitative	- Infection. - Arterial ducting. - Pneumothorax. - Hemorrhage. - AberrantTrails. - Phlebitis. - Damage of the subcutaneous cellular tissue, nerves and neighboring structures. - Thrombotic catheterocclusion.??? - Air embolism.	Referencing clinical history
State upon discharge	Nominal qualitative	- Alive - Dead	According to evolution

Table 1. Relationship between CVC sepsis and state at discharge.

	Sepsis					
	Si		No		Total	
Estado al egreso ??	No	%	No	%	No	%
Vivo?	15	10.4	98	68.5	113	79.0
Fallecido ??	2	1.3	28	19.5	30	20.9
Total	17	11.8	126	88.1	143	100

Chi 2 8.54 p <0.05.??? Source: Record of ongoing morbidity of the unit and individual clinical history.

The largest number of patients stayed for 7 to 10 days, coinciding with the referenced literature that the time of use for deep venous catheterization is in direct relation to patient's stay (Worthington, 2005). Researchers believe that results confirm that patient's stay in intensive care units depends on reasons for admission, the presence of complications that require the use of the procedure and the multiple applications of the technique in question. In the provision of care for serious cases, the precise indication of the use of deep venous catheterization is evaluated exhaustively and collectively, and is not a procedure free of risks, complications and cost.

In addressing the incidence of complications and the percentage of cases in which a deep venous approach was performed by YugularInterna, it was observed that there is a proportional relationship between them, which again reflects findings from the review of literature. (61.62%). Whilst the results from Saldar's study differ from the findings here this can be explained by the use of the CVC pathway in the majority of cases studied. Infection was a very frequent complication with incidence between 11 and 22%, producing bacteremia in 10% of cases. The incidence of sepsis was highly variable, ranging from 0% to 25%, which is consistent with the results of the study here. (Jalonen, 2005). These researchers considered it possible to modify morbidity figures when requirements are met, as they are not as expensive??? however, they are frequently violated. Except in emergency situations, CVC placement and care must always coincide with specific aseptic technique, which will include handwashing, sterile gloves, mask, hat, gown, field cloths and adequate antiseptic cleaning of the skin. The remainder of the complications emerge from the inadequate execution of the technique, sometimes practiced by resident physicians or other specialists. There was no relevant relationship between mortality and sepsis secondary to CVC, a result that does not deviate from other referenced studies. Ariza in his study found an association between mortality and the sepsis secondary to CVC, supported by microbiological diagnoses (Ariza *et al*., 2003). The repercussion of sepsis related to central venous catheterization results in an increase in morbidity in the form of increased stay and costs, and probably mortality, although this assertion is still under discussion. Although the study showed little relevance between CVS sepsis and mortality, it is considered a factor that negatively influences the prognosis of these patients.

Description of the proposed action plan to reduce the incidence of sepsis related to central venous catheterization:/should this be a sub heading???

An initial premise of the proposed action plan is to reduce the incidence of sepsis related to central venous catheterization, known to physicians and nurses who work in the critical care units, for example PPU, SIUM, ICU and Intensive Care Units.

The objective of You begin to use this plan of measures early and obtain the benefits expected with its use????

General: Rigorously follow the aseptic techniques for the procedure and prior handwashing.

Train all health personnel for proper handling of devices. Continuous monitoring of particular devices and epidemiological trends of the unit. Insertion: Wear sterile gloves for inserion of all catheters. Use the maximum barrier precautions in CVC and arterial insertion (hand washing, sterile gloves, cap, nasobuco, sobrebata, ample sterile fields). Provide trained personnel for the placement and care of intravascular devices. Record date of placement to control evolution. Insertion site care: Inspection of the daily insertion site with antisepsis if covered by dressing or gauze. Evaluate swelling, suppuration, pain. Replace dressings when wet, loose, or dirty. Clean the insertion site with antiseptic (iodopovidone or alcohol) waiting a few minutes to act before covering. Care of the fittings: Place the least number of three way valves. Replace tubing and triple-track wrenches every 72 hours, unless blood products are used, or emulsions of lipids, when they should be replaced within 24 hours after infusion commences. Clean the ports and injection ports with antiseptic before accessing them. Related to central venous catheters: Use one-lumen catheters unless an exclusive route is required for parenteral nutrition or vasoactive drugs. Use as an insertion site (subclavian, jugular, femoral) while assessing risks inherent to the insertion, and possibilities to keep the insertion site clean and dry. Use low-dose heparin to prevent CVC-related thrombosis and infection. If infection of the catheter is suspected, two blood cultures must be obtained before the start of antibiotic treatment. The catheter must be removed and its tip must be cultured using the semiquantitative method, always accompanied by direct Gram to guide preliminary results.

With the application of these measures, the incidence of sepsis associated with central venous catheterization is significantly reduced.

Conclusion

- The technique most used in the study was the approach of the??? internal jugular vein.
- The highest number of patients used the AVP between 7 and 10 days.
- The main cause that led to the use of these procedures was the administration of drugs and parenteral solutions.
- The most frequent complication found in relation to the CVC was infection, although having little relation to mortality.
- A plan of action was presented to the staff responsible for performing central venous catheterization.

REFERENCES

Agee KR, Balk RA. 1992. Central venous catheterization in the critically ill patient. *Crit Care Clin,* 8(4):677-86.

Agee, K.R., Balk, R.A. 2006. Central venous catheterization in the critically ill patient. *Crit Care Clin.,* 8:677.

Albuquerque Junior, F.C., Vasconcelos, P.R. 1998. Technical aspects of central venous catheterization. Curr Opin Clin Nutr Metab Care, 1(3):297-304.

Álvarez- Lerma, F., Palomar, M., Bermejo, B., Cerdá, E. *et al*. 2007. Estudio Nacional de vigilancia de infección nosocomial en unidades de cuidados intensivos. Informe del año 2001. *Med Intensiva,* 27:13-23.

Álvaro Pascual *et al*. 2004. Diagnóstico microbiológico de las infecciones asociadas a catéteres intravasculares.

Álvaro Pascual *et al*. Diagnóstico microbiológico de las infecciones asociadas a catéteres intravasculares. 2004. Procedimientos en Microbiología Clínica. Recomendaciones de la Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica. Editores: Emilia Cercenaedo y Rafael Cantón. www.seimc.org/ protocolos/microbiologia/cap15.htm

Amin, D.K., Shah, P.K. and Swan, H.J.C. 2004. Deciding when hemodynamic monitoring is appropriate. JCril111ness 8:1053.

Ariza, León C., Rodríguez Noriega, A., Fernández Mondejar, E. 2003. Conclusiones de la Conferencia de consenso en infecciones por catéter. *Medicina Intensiva*, 27:615-620.

Benolti Pn, Bothe, A., Miller, Jd, Blackburn Gl. 2004. Safe cannulation of the internal jugular vein for long term hiperalimentation. *Surg Ginecol Obstet*; 144:574.

Caballero López, A., Hernández Rodríguez H.P. 1988. Cateterización venosa profunda. En: Terapia intensiva. La Habana: Editorial Ciencias Médicas, 31-60.

Catton, J.A., Dobbins, B.M. , Kite, P., Wood, J.M. , Eastwood, K , Sugden S , Sandoe JA , Burke D , McMahon MJ , Wilcox, M.H. 2005. In situ diagnosis of intravascular catheter-related bloodstream infection: A comparison of quantitative culture, differential time to positivity, and endoluminal brushing. *Crit Care Med*. Apr; 33 (4):787-791.

Charalambous, C., Swoboda, S.M., Dick, J., Perl, T., Lipsett, P.A. 2004. Risk factors and Clinical impact of central line infectionsin the surgicalintensive care unit. *Arch Surg.,* 133:1241-1246.

Conferencia de consenso SEIMC-SEMICYUC. *Enfer Infecc Microbiol Clin* 2007 Feb; 22(1):99-104.

Connors , A., Speroff , T., y colaboradores: The effectiveness of right heart catheterization in the initial care of critically ill patients. JAMA 276:889-2006.

Curly, F.J., Smyrnios, N.A. Routine monitoring of critically ill patients. In: Rippe JM, Irwin.

Dee Boyd, K., Thomas, S., Gold, J. 2004. A prospective study of complications of pulm Pablo Casas M, Penas Ríos JL.: Guía para la prevención de complicaciones infecciosas relacionadas con catéteres intravenosos. [en línea] [14 de febrero de 2006onary artery catheterizations in 500 consecutive patients. Chest 84:245.

Drewett SR. Complications of central venous catheters: nursing care. *Br J Nurs* 2006;10;9(8):466-8,470-8.

Englelstein, E.D., Zipes, D.P.2001. Sudden cardiac death. En: Alexander RW, Schlant RC, Fuster, editores. The heart arteries and veins. Nueva York: Mc Graw-Hill, 55,56

Ermakov, S., Hoyt, J. 2005. Pulmonary artery catheterization. Crit Care Clin 8:773.

Fundación Santafé de Bogotá. Guía para el manejo del catéter venoso central. julio de 2004.

Garland, J.S., Alex, C.P., Mueller, C.D. *et al*. 2004. A randomized trial comparing povidone-iodine to a chlorhexidine gluconate-impregnated dressing for prevention of central venous catheter infections in neonates. Pediatrics 15,16,17.

Gonzáles, M., Latto, I., Shang ,W. 1999. Handbook of percutaneous central venous catheterization. Ed: Saunders Co. Philadelphia. 28,29,30.

Guaegi, A., Feihl, F., Perret, C. 2004. Intensive care physicians'insufficient knowledge of right heart catheterization at the bedside: time to act. Crit Care Med 25:213.

Guillamón Estornell, I. 2003. "Inserción de catéter venoso periférico y complicaciones derivadas de la terapia iv" Rev. Investigación y Cuidados. Vol.2, nº3. Pág.6-10. Año.45,47,48.

Hazinski, M.F., van Stralen, D. 2006. Physiologic and anatomic differences between children and adults. In: Essentials of Pediatric Intensive Care. Levin D, Morriss F (Eds). St. Louis, Quality Medical Publishing, 35,36,37.

Headley, J. 2003. Invasive hemodynamic monitoring: physiological principles and clinical applications. Baxter Healthcare Corporation.

Intravenous techniques. In: Textbook of Advanced Cardias Life Support. Dallas, *American Heart Association*. 2004, pp 6-1.15,16,17

Jalonen, J. 2005. Invasive hemodynamic monitoring: concepts and practical approaches. *Ann Med* 29:313. 6,7

León, C., Ariza, J. Guías para el tratamiento de las infecciones relacionadas con catéteres intravasculares de corta permanencia en adultos:

Lodato, R. 2004. Arterial pressure monitoring. En Tobin E.: Principles and practice of intensive care monitoring. McGraw Hill, Inc. New York.8,9,10

López, J.B., Fernández, B., Coto, G.D., Ramos, A. 2004. Estudio prospectivo sobre catéteres epicutáneos en RN. Grupo de Hospitales Castrillo. *An Esp Pediatr* 53(2):138-47.

Lucey B, Varghese JC, Haslam P,Lee MJ. Routine chest radiographs after central line insertion: mandatory postprocedural evaluation or unnecessary waste of resources? *Cardiov Intervent Radiol* 1999;22(5):381-4.

Luque Gómez, A., Simonet Huertas, N., Ramos Viciana, M.I ., Palacios Moreno, M., Pardo Hernández, P.E. 2006. Profilaxis de las complicaciones infecciosas de los catéteres venosos centrales. Rer Esp Anestesiol Reanim 49 (2):19-34.

Magder, S. 2006. Cardíac output. En Tobin E.: Principles and practice of intensive care monitoring. McGraw Hill, Inc. New York.

Magder, S. 2006. Central venous pressure monitoring. *Curr Opin Crit Care* 12:219. 16,17,18

Mallery, C. 2007. Suspected central venous catéter-associated infection:can the catéter be safely retained? Intensive care Med 2004;30:2005.

Menderson, S. 2006. Central venous pressure monitoring. *Curr Opin Crit Care* 12:219.

Muller-Premru, M., Cernelc, P. 2004. Molecular epidemiology of catheter-related bloodstream infections caused by coagulase-negative staphylococci in haematological patients with neutropenia. *Epidemiol Infect*. 32,33,34

Nacional Nosocomial Infections Surveillance (NNIS) System Report, data summary from January 1992 Through June 2003, issued August 2003. *Am J Infect Control* 2003;31:481-494.

Norris, R.M. 2001. on behalf of The United Kingdom Heart Attack Study Collaborative Group. Fatality outside hospital from acute events in three British health districts: 1994-1995. *Br Med J.,* 316: 1.065-1.070

O´Grady, N.P., Alexander, M., Dellinger, E.P., Maki, D.G. *et al*. 2004. Guidelines for the Prevention of intrvascular Catheter – Related Infections. *Clin Infect Dis.,* 35:1281-1307.

Olaechea, P., Alvarez Lerma, F., Palomar, M., Cerda, E. 2004. ENVIN-UCI. Impacto de la bacteriemia primaria y relacionada al catéter con la estancia y mortalidad de pacientes ingresados en UCI. Med Intensiva, 28(S1):14.

Pinsky, M. 2005. Hemodynamic profile interpretation. En Tobin E.: Principles and practice of intensive care monitoring. McGraw Hill, Inc. New York.

Polderman KH, Girbes AJ. Central venous catheter use. Part 2: infectious complications. Intens Care Med 2004;28(1):18-28.

Polderman, K.H., Girbes, A.J. 2002. Central venous catheter use. Part 1: mechanical complications. *Intens Care Med.,* 28(1):1, 17.

Procedimientos en Microbiología Clínica. Recomendaciones de la Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica. Editores: Emilia Cercenaedo y Rafael Cantón.

Ramanathan, R., Durand, M. 2005. Blood cultures in neonates with percutaneous central venous catheters. Arch Dis Child.

Ruiz de la Fuente Tirado S, Segarra Castelló L, Sabater Pons L, González Arráez J, Cortina Greus P. Tendencias actuales de la mortalidad por procederes invasivos en España. Rev Esp Cardiol 2003; 40: 311-316.

Safdar, N., Fine, J.P. Maki, D.G.2005. Meta-Analysis: Methods for diagnosing intravascular device-related bloodstream infection. *Ann Inter Med.,*142:451-466.

Shoemaker, W.C., Parsa, M.H. 2005. Invasive and noninvasive physiological monitoring. In: Shoemaker WC, Ayres S, Grenvik A, *et al* (Eds) . Textbook of Critica] Care. Third Edition. Philadelphia, WB Saunders, p 252.

Steele, R., Irvin, C.B. 2006.Central line mechanical complication rate in emergency medicine patients. *Acad Emerg Med.,* 8(2):204-7.

Vaque, J., Roselló, J. 2006. Evaluación de la prevalencia de las infecciones nosocomiales en los hospitales españoles. EPINE 1990-1999. Madrid: Sociedad Española de Medicina Preventiva, Salud Publica e Higiene.

Worthington, T., Elliott, T.S.2005. Diagnosis of central venous catheter related infection in adult patients. *J Infect.* Nov; 51(4):267-80.

****