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ANTIBIOTIC PROPHYLAXIS FOR CHEMOPORT INSERTION

HEALTH TECHNOLOGY ASSESSMENT SECTION
MEDICAL DEVELOPMENT DIVISION

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DISCLAIMER

Technology review is a brief report, prepared on an urgent basis, which draws on restricted reviews from analysis of pertinent literature, on expert opinion and / or regulatory status where appropriate. It has been subjected to an external review process. While effort has been made to do so, this document may not fully reflect all scientific research available. Additionally, other relevant scientific findings may have been reported since completion of this review.

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DISCLOSURE

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EXECUTIVE SUMMARY

Background

The introduction of totally implantable venous access devices or chemoports in 1980s provide an easy vascular access for delivery of chemotherapy, fluids, medications, blood products and parenteral nutrition solutions.It has become widely used for central venous access and in United States alone, more that 400 000 of such device were sold each year. The use of antibiotic prophylaxis for these implanted devices remains controversial despite the prevalence of it. Currently, there is no standard of care regarding antibiotic prophylaxis for fully implanted central venous access devices.

The risk of totally implantable venous access device-related infections in patients with cancer seems to have remained unchanged over time, with infection rates of 0.21 in 1993 and 0.20 in 2011. Owing to the reduced risk of infection, totally implantable venous access devices are favoured over other long-term intravascular venous catheters for use in treatment of solid tumours and haematological malignant disease.

Early totally implantable venous access device-related infections (30 days or earlier) are more frequently caused by *S. aureus* than late infections (50% vs 12%). The risk of extraluminal colonisation is low and mostly occurred during insertion which results in surgical site infections. Although totally implantable venous access device-related infections are uncommon compared with other types of catheters, the cost to treat these infection are costly and usually necessitate removal of the device. This would delay the administration of chemotherapy and require an increase in the level of care (hospital admissions). Prevention is critical to minimize the likelihood of infections associated with implantable ports, as these are difficult to treat and potentially fatal.

Totally implantable venous access device is available in Malaysia. Questions arise as to whether giving prophylaxis antibiotic before insertion of such devices would reduce the risk of getting infections. This technology review was requested by a pharmacist to assess the cost-effectiveness of antibiotic prophylaxis in totally implantable venous access device insertion.

Objective/aim

The objective of this systematic review was to assess the safety, efficacy / effectiveness, economic and organizational implication of antibiotic prophylaxis for totally implantable venous access port insertion.

Results and conclusions

A total of 296 titles were identified through the Ovid interface. There were seven

studies included in this review: four RCTs, one cohort study and two cross-sectional studies. The studies were conducted in Italy, Turkey and United States. There was no cost-effectiveness analysis article retrieved.

Efficacy / Effectiveness

There were six studies retrieved on the efficacy / effectiveness of antibiotic prophylaxis in totally implantable venous access port or chemoport insertion.

There was fair level of retrievable evidence to suggest that antibiotic prophylaxis for chemoport insertion was not effective in reducing infection rates.

- About 47% (15/32) of patients in the teicoplanin arm developed infections compared to 37% (11/30) in the control arm, p = not significant.
- No significant difference in infection rates, body temperatures and white blood cell count in antibiotic group and non-antibiotic group.
- Wound infections were reported in 2.5% (5/201) of the placebo group versus 3.0% (6/203) in the antibiotic prophylaxis group (no significant difference).
- Catheter related infection was reported in 2.5% (9/356) in group that did not receive antibiotics before the procedure and 0% (0/103) in the prophylaxis group, p = 0.218.
- Central line-associated bloodstream infections within 30 days were reported in 0.6% (7/1,102) of those who did not receive antibiotic prophylaxis versus 0% (0/81) of those who received antibiotic prophylaxis (p = 0.59).

In terms of safety, there was very limited retrievable evidence. However, severe nausea and vomiting were reported as adverse events in one study. There was no retrievable evidence on cost-effectiveness. Few international guidelines did not recommend the use of antibiotic prophylaxis in chemoport insertion.

Methods

Electronic databases were searched through the Ovid interface: Epub Ahead of Print, In-Process & Other Non-indexed Citations, Ovid MEDLINES ® Daily and Ovid Medline ® 1946 to Present, EBM Reviews - Cochrane Central Register of Controlled Trials - July 2015, EBM Reviews - Cochrane Database of Systematic Reviews - 2005 to June 2015, EBM Reviews - Health Technology Assessment – 3rd Quarter 2015, EBM Reviews – NHS Economic Evaluation Database 2nd Quarter 2015, and EMBASE. Google was used to search for additional web-based materials and information. No limits were applied. Additional articles were identified from reviewing the references of retrieved articles. Last search was conducted on 15 October 2016.

ANTIBIOTIC PROPHYLAXIS IN CHEMOPORT INSERTION

1. BACKGROUND

The introduction of totally implantable venous access devices or chemoports in 1980s provide an easy vascular access for delivery of chemotherapy, fluids, medications, blood products and parenteral nutrition solutions. It has become widely used for central venous access and in United States alone, more that 400 000 of such devices were sold each year.[1] In Germany, 80,034 totally implantable access port implantations were performed in 2008 during a hospital stay.[2] The use of antibiotic prophylaxis for these implanted devices remains controversial despite the prevalence of it. Antibiotic is not recommended in literature when a central venous catheter is inserted.[3] Currently, there is no standard of care regarding antibiotic prophylaxis for fully implanted central venous access devices.[3]

Patients' risk factors for infection differ, depending on the indication for totally implantable venous access device insertion. The risk of totally implantable venous access device-related infections in patients with cancer seems to have remained unchanged over time, with infection rates of 0.21 in 1993 and 0.20 in 2011.[1] Totally implantable venous access ports should be inserted as early as possible in patients with oncological or haematological diseases because the risk of infection is increase by neutropenia.[4] There is no external hub manipulation in port systems; making it more resistant to infection.[5] Owing to the reduced risk of infection, totally implantable venous access devices are favoured over other long-term intravascular venous catheters for use in treatment of solid tumours and haematological malignant disease. [1]

The definition of "catheter-related infections" varies considerably among investigators and studies. It is necessary to differentiate between local infection and bacteremia/fungemia. Local infections are subdivided into superficial infections and deep pocket infections (defined as spread of the infection into the subcutaneous part of an implanted port systems).[6]

Early totally implantable venous access device-related infections (30 days or earlier) are more frequently caused by *S. aureus* than late infections (50% vs 12%).[1] The risk of extraluminal colonisation is low and mostly occurred during insertion which results in surgical site infections. If the skin has not been completely cleaned; repeated punctures with Huber needle might lead to contamination.[1] The main microorganisms responsible for catheter-related infections in totally implantable venous access port patients are coagulase-negative staphylococci, *S. aureus*,

and Candida species. Although totally implantable venous access device-related infections are uncommon compared with other types of catheters, the cost to treat these infections are costly and usually necessitate removal of the device. This would delay the administration of chemotherapy and require an increase in the level of care (hospital admissions).[7]

Prevention is critical to minimise the likelihood of infections associated with implantable ports, as these are difficult to treat and potentially fatal. According to a comprehensive review by Bouze et al., catheter infections may be promoted by the following mechanisms: contamination at insertion, migration of skin organisms along the external catheter hub by substances brought into or passing through the catheter lumen, contamination by infusate; and finally haematogenous infection from a distant site.[8] Infections can be avoided by careful and strict antiseptic handling, thus minimizing contamination.

Totally implantable venous access device is available in Malaysia. Questions arise as to whether giving prophylaxis antibiotic before insertion of such devices would reduce the risk of getting infections. This technology review was requested by a pharmacist to assess the cost-effectiveness of antibiotic prophylaxis in totally implantable venous access device insertion.

2. OBJECTIVE / AIM

The objective of this systematic review was to assess the safety, efficacy / effectiveness, economic and organizational implication of antibiotic prophylaxis in chemoport insertion.

3. TECHNICAL FEATURES

3.1. Parts of totally implantable venous access port

An implanted port is a type of central venous catheter. It differs from other central venous catheter as it consists of a port body which is a small reservoir and a catheter that provide access to patients larger veins. This reservoir makes it possible for the port to be completely implanted under the skin, which may reduce the infectious complications.[9] The ports has a self-sealing septum that is accessible by needle puncture through intact skin. One end of the tube sits in a vein and the other end is attached to the injection port that sits underneath patient skin.[10] The port is usually placed about an inch below the the center of the right collarbone as depicted by Figure 1.

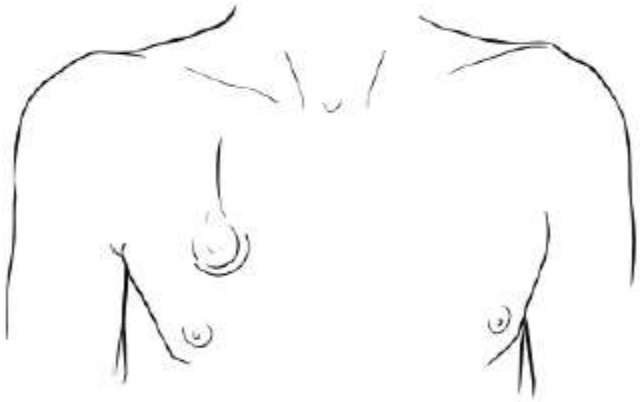

Figure 1 : Position of totally implantable venous access port

There are currently many different implantable ports commercially available such as Vortex (AngioDynamics, Waterbeach, Cambridge, UK), Power Port®Vue Implantable Port ,Bard PortTM,(Bard Inc., Salt Lake City, UT), PORT-A-CATH (Smith Medical Inc., MN) to name a few. There are two types of implanted ports; a single lumen port with one access point and a double lumen port with two access points (Figure 2). Double lumen ports are use for patient that need more than one point of access.[11]

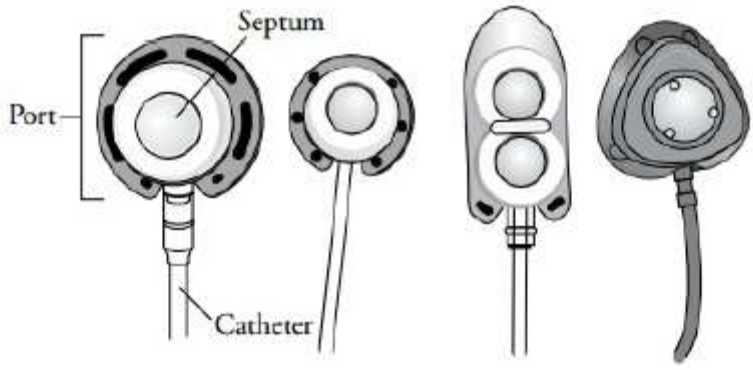

Figure 2 : Types of implanted ports

3.2. Catheter types and materials

Ports are made of various material including plastic, titanium, silicon rubber, polyurethane, and a combination of these substances. Catheters are made of radiopaque silicone rubber or polyurethane. The life span of septum depends on the gauge of needles used to access the port and the type of needle used i.e. if a large needle is used, the septum will wear out after fewer punctures than when a smaller gauge needle is used.

3.3. Indications

Totally implantable venous access ports are indicated for patients who need long term intravenous access for: [4]

i. Chemotherapy
ii. Total parenteral nutrition
iii. Transfusions

3.4. Technique of insertion

The technique of implant of totally implantable venous access device is different from other central venous catheter. Port pocket site selection by clinicians should allow for port placement in an anatomic area that provides good port stability, does not interfere with patient mobility, does not create pressure points or interfere with clothing. Insertion must be done by trained staffs, commonly by surgeons or interventional radiologists. The two main approaches for central venous cannulation are open insertion into the distal cephalic vein by a surgeon or direct puncture of the subclavian vein and insertion of the totally implantable access port catheter by the Seldinger technique by an interventional radiologist or surgeon.[2, 12, 13] The port system must be placed in a vessel with a large enough lumen in order to dilute chemotherapeutic drugs and minimize venous damage.[4]

The port system is access using a special non-coring Huber needle. The silicon port membrane needs to be punctured vertically in order to avoid bending the tip and care must be taken to observe strictly aseptic precautions. It has been shown that 2% chlorhexidine-based preparations reduce catheter-related infection most effectively. However a 70% alcohol solution, an iodophor or a tincture of iodine can be used alternatively.[4]

4. METHODS

4.1. Searching

Electronic databases were searched through the Ovid interface: Epub Ahead of Print, In-Process & Other Non-indexed Citations, Ovid Medline® Daily and Ovid Medline ® 1946 to present, EBM Reviews - Cochrane Central Register of Controlled Trials - July 2016, EBM Reviews - Cochrane Database of Systematic Reviews - 2005 to June 2016, EBM Reviews - Health Technology Assessment – 3rd Quarter 2016, EBM Reviews – NHS Economic Evaluation Database 2nd Quarter 2016, EMBASE and PubMed. Google was used to search for additional web-based materials and information. No limits were applied. Additional articles

were identified from reviewing the references of retrieved articles. Last search was conducted on 21 Oktober 2016.

Appendix 1 showed the detailed search strategies.

4.2. Selection

A reviewer screened the titles and abstracts against the inclusion and exclusion criteria and then evaluated the selected full text articles for final article selection.

The inclusion and exclusion criteria were:

Inclusion criteria

Population	Patient indicated for chemoport insertion
Interventions	Antibiotic prophylaxis
Comparators	No antibiotic prophylaxis
Outcomes	i. Safety: - Adverse events of antibiotic prophylaxis ii. Efficacy/effectiveness (reduction of infection) iii. Economic implication (cost, cost-effectiveness) iv. Organizational issues: training, space, length of hospital stay
Study design	Health Technology Assessment (HTA), Systematic Review (SR), Randomised Controlled Trial (RCT), Non randomised controlled trial, cohort, case-control and cross sectional study
	English full text articles

Exclusion criteria

Study design	Studies conducted in animals, narrative reviews, or case report
	Non English full text articles

Relevant articles were critically appraised using Critical Appraisal Skills Programme (CASP) and graded according to US/Canadian preventive services task force (Appendix 2). Data were extracted and summarised in evidence table as in Appendix 3.

5. RESULTS AND DISCUSSION

A total of 296 titles were identified through the Ovid interface and Pubmed. There were seven studies included in this review: four RCTs, one cohort study and two cross-sectional studies. The studies were conducted in Italy, Turkey and United States.

5.1. EFFICACY / EFFECTIVENESS

There were three RCTs, one cohort study and two cross-sectional studies retrieved in full text related to the efficacy / effectiveness.

Ljungman P et al. conducted a randomised controlled trial comparing two doses of teicoplanin with no antibiotic therapy administered at the time of insertion of an indwelling central venous catheter. The study duration was 21 days from the day of inclusion into the study. A total of 66 patients were included in this study but one patient was lost to follow-up and three patients were excluded due to protocol violations. Patients age between 18 to 80 years were scheduled for placement of central venous catheter for the treatment of acute leukemia or aplastic anemia or prior to allogeneic autologous stem cell transplantation were included in this study. The exclusion criteria were; fever at the time of catheter insertion, allergy to vancomycin or teicoplanin, and antibacterial chemotherapy within 48 hours before the start of the study, with the exception of prophylactic ciprofloxacin or trimethoprim-sulfamethoxazole. Thirty three patients were randomised to the teicoplanin and 32 to the control arm. There were no significant difference between the two groups in terms of characteristics. The patients in the control group did not received any prophylaxis while the other group were given two doses of teicoplanin before surgery. The dosage of teicoplanin was adjusted according to body weight; 55 kg (300 mg), 55.0 - 74.9 kg (400 mg) and over 75.0 kg (500 mg).The result of the study showed that the number of patients who developed microbiologically or clinically documented infections in the teicoplanin arm were slightly higher compared to the control arm. A total of 47% (15/32) of the patients in the teicoplanin arm developed infections, while in the control arm, 37% (11/30) developed infections as shown in the Table 1 below.

Table 1: Classification and distribution of infection episodes

Classification of episode	Teicoplanin	Control	*P*-value
Microbiologically documented gram-positive infection	10	6	ns
Microbiologically documented other infection	2	0	ns
Clinically documented catheter associated infection	1	2	ns
Clinically documented other infection	2	3	ns
Total documented infection	15	11	ns
Unexplained fever	9	8	ns
Total infection episodes	24	19	ns

There were no statistical difference between the two groups in any of the defined subgroups of infection episodes. The authors did not specify the method of randomisation and both participants and outcome assessors were not blinded to the intervention. [14, level II-2]

While in another study, Di Carlo I et al. performed a randomised controlled trial of 108 patients with solid tumors requiring totally implantable venous access device. The patients were divided into two randomised arms [group A (antibiotic)], group B (no antibiotic) with each arm consisting of 54 patients. The were no statistically significant difference between the patients' characteristics in Group A and Group B. Group A was given 1 g of ceftazidime administered 10 minutes before the skin incision. The procedures were performed surgically in the operating room and surgeons were informed of the group to which the patient belonged 30 minutes before the beginning of the procedures. The patients were admitted to the hospital overnight after the placement of the totally implantable venous access devices and were followed for 30 days after placement. The presence of infection was determined by fever, leukocytosis, and signs of infection at the surgical site. They reported that there was no infection identified in either group. On the first, third, and seventh days after the procedure, body temperature and white blood cell (WBC) counts remained within normal limits in both groups and no statistically significant difference was evidenced comparing the mean temperatures and the WBC counts in groups A and B as shown in the Figure 3 and Table 2.

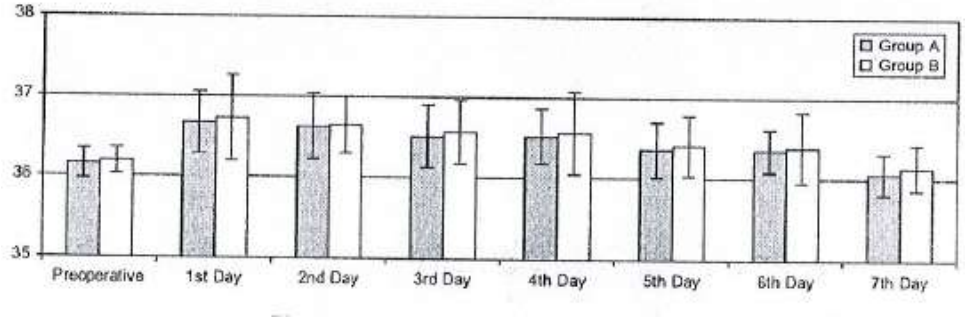

Figure 3: Patients' body temperatures

Table 2 : Mean value and SD of WBC

	Group A	Group B	
	Mean ± DS	Mean ± DS	P
WBC Preoperative	5.981 ± 1.24	5.989 ± 1.22	ns
WBC 1st day	6.911 ± 1.14	6.517 ± 1.32	ns
WBC 3rd day	6.637 ± 1.15	6.361 ± 1.18	ns
WBC 7th day	6.365 ± 1.23	6.294 ± 1.42	ns

The limitation of this study were the method of randomisation were not described and both participants and outcome assessors were not blinded to the intervention.[12, level II-2]

Karanlik H et al. performed a prospective, randomised, double-blind, placebo-controlled trial of 404 patient undergoing totally implantable venous access device insertion between September 2008 and December 2009. The patients were assigned to either antibiotic prophylaxis [cefazolin (203 patients)] or placebo (201 patients).The antibiotic group received 1 g of intravenous cefazolin while the other group were given equal volume of normal saline (placebo). All totally implantable venous access devices were placed via a subclavian approach with verification of placement by chest radiograph obtained after the procedure. Exclusion criterias includes; refusal to participate, lack of compliance, leukopenia, antibiotic allergy, history of diabetes mellitus, use of antibiotics < 1 week before the procedure, upper neck/thoracic radiation exposure, and use of totally implantable venous access devices for other reasons aside from chemotherapy. Patients were monitored up to 30 days after discharge. Wound infection were categorised as either superficial or deep. There were 11 patients (2.7%) who presented with wound infection; five of these patients had received placebo (5/201 or 2.5%) and six had received antibiotic prophylaxis (6/203 or 3.0%) as shown in Table 3.

Table 3: Details of patients with infection from a group of 404 patients after totally implantable venous access device surgery randomised between antibiotic prophylaxis and placebo.

Patient no.	Allocation group	Age, y	Sex	Postoperative day detected	Microorganism cultured	Type of infection	Treatment	Outcomes
1	Placebo	27	F	5	*S epidermidis*	SSSI	Drainage, antibiotics	Recovered
2	Placebo	47	F	7	No culture	DSSI	Antibiotics	Recovered
3	Antibiotic	52	M	7	No culture	SSSI	Antibiotics	Recovered
4	Placebo	53	F	7	No culture	SSSI	Drainage, antibiotics	Recovered
5	Placebo	56	M	12	*S aureus*	SSSI	Drainage, antibiotics	Recovered
6	Placebo	58	F	5	No culture	SSSI	Antibiotics	Recovered
7	Antibiotic	60	M	10	*S aureus*	DSSI	Drainage, antibiotics	Port removed
8	Antibiotic	66	M	5	No culture	SSSI	Antibiotics	Recovered
9	Antibiotic	40	F	7	No culture	SSSI	Drainage, antibiotics	Recovered
10	Placebo	65	F	5	No culture	SSSI	Antibiotics	Recovered
11	Antibiotic	49	M	8	No culture	SSSI	Antibiotics	Recovered

DSSI = deep surgical site infection; SSSI = superficial surgical site infection.

There was no significant difference in the rate of infection between patients who received antibiotic prophylaxis and patients who did not. Karanlik H et al. concluded that there was no benefit of antibiotic prophylaxis for totally implantable venous access device insertion in routine practice. A single dose of cefazolin for prophylaxis would cost less than the treatment cost of a patient with postsurgical sepsis with a resistant organism. Although the cost of prophylaxis antibiotic is less, the use of it may induce development of bacterial resistance and increase

further opportunistic nosocomial infections and surgical site infections. As antibiotic prophylaxis did not affect the rate of infection, the authors suggested to avoid administering it before the placement of totally implantable venous access device.[6, level I]

Scaife CL et al. conducted a retrospective cohort study in 2010 on whether the use of perioperative prophylactic antibiotics for totally implanted port insertion would reduce the incidence of catheter-related infection. A total of 459 patients underwent surgical placement of totally implantable port between January 2007 and September 2009 were involved in this study. All procedures were performed by two surgeons; one routinely treated patients with a single dose of antibiotic, directed against gram-positive skin flora, given by the anaesthesiologist within 30 minutes before the procedure. The second surgeon did not routinely use prophylactic antibiotics. There was no significant differences between the antibiotic group treatment (n=103) or no-treatment groups (n = 359), relative to age, BMI, diagnosis of diabetes (either noninsulin or insulin treatment types), preoperative WBC, number of site attempts, or subclavian placement position. The mean age of patients was 55.7 ± 14.1 years. Thirty four percent were male and the mean BMI was 27.4 ± 6.7. A total of 356 patients (77.6%) did not receive antibiotics while the remaining 103 patients were given one of these antibiotic before the procedure (cefazolin (89), levofloxacin (6), cefoxitin (1), clindamycin (4) piperacillin and tazobactam (1), cefazolin and clindamycin (1) and cefazolin and gentamicin (1). The decision for antibiotic treatment was based on allergy history and whether or not the patient would undergo another procedure apart from the implantation of the port. There were no cases of antibiotic-related anaphylaxis reported in this study. The primary endpoint of the study was port removal within 30 days of placement. The authors defined catheter-related infection as induration at the surgical site, positive blood culture, or suspicion of infection. The result of the study showed that nine catheter-related infection occurred in the group that did not receive antibiotics (9/356 or 2.5%) before the procedure and none in the prophylaxis group (0/103 or 0%). The difference of infection rate between the two groups was not statistically significant (P = 0.218). The devices was subsequently explanted in five out of nine (56%) of the patients with catheter related infections. All of the patients with catheter-related infections were treated with therapeutic antibiotics. Seven out of nine patients (77.7%) with catheter-related infections were either visited emergency room or admitted to the hospital for treatment. The study also found that the factors that were associated significantly with catheter-related infections were subclavian vein placement (P = 0.005) and multiple insertion site attempts (P = 0.018) as shown in Table 4.

Table 4 : Comparison between infection groups

	Infection (n = 9)	No infection (n = 449)	P value*
Subclavian placement rate, %	44.4 (4/9)	8.4 (38/450)	.005
Insertion site attempts	1.67 ± 1.3	1.13 ± .4	.018
BMI	27.2 ± 4.1	27.5 ± 6.7	.77
Diabetes diagnosis rate, %†	22.2 (2/9)	11.5 (52/450)	.29
Age, y	52.6 ± 19.0	55.9 ± 14.0	.78
Female sex, %	55.6	66.2	.49
Preprocedure WBC, k/μL	8.1 ± 2.7	7.2 ± 3.5	.26
Complication rate, %	0	2.0	.99
Procedure time, min	30.2 ± 14.1	29.8 ± 12.6	.99

*Chi-square analysis with the Fisher exact test and the Mann-Whitney *U* test.
†Both insulin and noninsulin diabetes diagnosis.

From this study, the authors concluded that a single dose of prophylactic antibiotics may decrease the incidence of catheter-related infections for central venous access ports but the difference does not reach statistical difference. This study was limited by small sample size and the retrospective cohort. The authors' final recommendation to administer intravenous antibiotics appeared to be based primarily on financial factors related to subsequent care, as the infection rate was not found to be statistically significant.[15, level II-3]

Covey AM et al. carried out a retrospective cross-sectional study on the rate of early infection without antibiotic prophylaxis before the placement of totally venous access port in the interventional radiology suite. A total of 1,183 implantable ports were placed in 1,167 patients. Two implantable ports were placed in 16 patients. There were 717 women and 467 men involved in this study. Mean age was 59.2 years (range between 16 to 92 years). The most common diagnoses were breast cancer, colorectal cancer, lymphoma, and pancreatic carcinoma. Eighty one of 1,167 patients (6.8%) who underwent totally implantable venous access port placement received prophylactic antibiotics before the procedure. Of the patients who received antibiotics, 78% received them from an unrelated reason. A total of 12 from 1183 totally implantable venous access ports (1%) were removed because of suspicion of infection; all of these were removed from patients who did not receive prophylactic antibiotics. No patient who received an antibiotic prior to totally implantable port insertion developed central line-associated bloodstream infection within 30 days of placement (0/81 or 0%). Seven out of 1,102 implantable ports were removed in patients who did not receive antibiotic prophylaxis due to

central line-associated bloodstream infection (7/1,102 or 0.6%). There was no significant difference between the rates of totally implantable venous access device removal because of central-line-associated blood stream infections in patients who received antibiotics before the procedure versus patients who did not received antibiotics before the procedure (P = 0.59). The authors did not recommend antibiotic prophylaxis for totally implantable venous access device insertion because of the extremely low infection rate with or with-out antibiotics. The study was limited by its retrospective nature and lack of a formal antibiotic arm. However, the large sample size increase the strength of the study.[7, level II-3]

Nelson ET et al. conducted a cross-sectional study among fellows of the American College of Surgeons to determine the practice pattern of prophylactic antibiotic in the placement of fully implanted central venous access ports. A single-page survey consisting of 18 questions were sent to 5000 representative sample of American College of Surgeons members. There were 1,091 surveys returned and 1,080 (21.7%) complete survey were evaluated. Majority of the respondents (790 or 73.1%) were based in nonacademic practice setting. Seven hundred seventy seven of 882 respondent gave antibiotic prophylaxis before the placement of totally implantable venous access ports. Significantly more respondents in nonacademic practices placed totally venous access port (88%) than surgeons in academic practices (67.2%) (P < 0.001). Surgeons who placed the devices had been in practice an average of 17.2 ± 8.4 years (range 0.4 to 50 years). Of those who gave antibiotic prophylaxis, 68% chose first-generation cephalosporin as antibiotic of choice. The definition of catheter-related infection in the survey questions was "induration in the operative site that resulted in antibiotic treatment, or positive blood cultures, or suspicion of infection which led to line removal within 30 days of catheter insertion". The survey found that 76% of the respondents chose the answer for "their estimated catheter-related infection rate" as < 1%, when offered choices of <1%, 1% to 5%, 6% to 10%, >10%, and "do not know". The study showed there was no significant difference in chosen catheter-related infection (<1% or ≥ 1%) on the basis of the number of years placing ports (<10 versus ≥ 10 years, P = 0.96). There was a statistical difference in the choice of infection rate and practice setting, with academic choosing ≥ 1% at a rate of 31.3%, compared with nonacademic at 22.6% (P = 0.02). The higher infection rate of ≥ 1% was chosen more often by respondents who chose the internal jugular vein as their preferred placement site, 32.5% compared with 21.8% for those who preferred the subclavian vein (P = 0.002). The authors assumed that the high rate of prophylactic antibiotic used by respondents is likely due to attempt to prevent potential morbidity such as early infections and the related costs to such an event. The study showed that despite the majority of respondents estimated that the expected

catheter-related infection rate was <1%, most of them still chose to use prophylactic antibiotic. The authors concluded that prophylactic antibiotic should be routinely given when totally implantable venous access ports are placed. One of the limitation of this study was it is a survey with only 21.7% response rate. The authors did not differentiate the specific use of the ports such as for chemotherapy or total parenteral nutrition which could have affected the use pattern; hence the risk of getting infection.[3, level III]

5.2. SAFETY

Adverse events

Raad II et al. conducted one prospective crossover randomised trial to evaluate the efficacy of novobiocin and rifampin prophylaxis for prevention of intravascular catheter infection in cancer patient. The primary objective of the study was to compare the incidence of infection experienced by the group that received oral antibiotics and the control group. A total of 26 patients with advanced melanoma who received biochemotherapy that included interleukin-2 treatment at The University of Texas M. D. Anderson Cancer Centre were enrolled in this trial. Patients were randomised in a crossover study to either received prophylactic antibiotics or be observed only. The antibiotic regimen consisted of novobiocon 500 mg plus rifampin 300 mg given orally every 12 hours over a period of 35 days. Then all patients were crossed over to the opposite arm of the study for a second equivalent course. From the study they reported that from 26 patients who participated in the study, nine of the patients failed to tolerate the oral antibiotic regimen because they developed severe nausea and vomiting during the course of treatment, resulting in discontinuation of antibiotics.[16 level II-1]

Scaife CL et al. who conducted a retrospective cohort study in 2010 on the effectiveness of perioperative prophylactic antibiotics for totally implanted port insertion reported that there were no case of antibiotic-related anaphylaxis in their study.[15, level II-2]

5.3. COST / COST-EFFECTIVENESS

There was no cost-effectiveness analysis retrieved.

However, Scaife et al. described in their study that catheter-related infections often results in significant cost and patient morbidity. Although a formal cost analysis was not performed, periprocedural costs for a single dose of prophylactic antibiotics used in their study ranged from US $50 to

US $300. This is relatively inexpensive compared with the cost for hospital admission, catheter removal, and therapeutic antibiotics, costing up to US $49,000 for 1 patients in the study.[15, level II-3]

There were no local data available on the cost for treatment of infections in patients with chemoports that includes hospital admission, catheter removal and therapeutic antibiotics.

Cost of prophylactic antibiotic

The cost of one vial of 1 g of cefazolin is approximately RM 12.50, 1 g of ceftazidime; RM 12.16 and 1 g of vancomycin; RM 5.26.

Cost of totally implantable venous access port

The cost of one totally implantable venous access port in Malaysia ranges around RM 700++ to RM 1500++.

5.4. ORGANIZATIONAL

While chest port placement was initially performed in an operating room by surgeons, there has been an increasing transition to placement by interventional radiologists in imaging suites due to their ability to provide this service at lower costs. There are similar training and certification requirements for interventional radiologists and surgeons.[17]

The two main approaches for insertion of totally implantable venous access ports are:[2]

1. Open insertion into the distal cephalic vein by a surgeon
2. Direct puncture of the subclavian vein and by the Seldinger technique by an interventional radiologist or surgeon

Guidelines

Practice Guidelines for Adult Antibiotic Prophylaxis during Interventional Radiology Procedures 2010 did not recommend the use of antibiotic prophylaxis before the insertion of totally implantable ports but it may be use in specific clinical scenarios such as immunocompromised patients who require catheter placement before chemotherapy and those with a history of catheter infection (1g IV cefazolin or in the case of penicillin allergy, vancomycin or clindamycin).[18]

The Centers for Disease Control and Prevention (CDC) and Healthcare Infection Control Practices Advisory Committee (HICPAC) did not recommend the use of systemic antibiotic prophylaxis routinely before

insertion or during use of an intravascular catheter to prevent catheter colonisation.[19]

Department of Health Queensland did not recommend the use of antibiotic prophylaxis at the time of insertion or during use of a port to prevent catheter colonisation or bloodstream infection; as stated in their Guideline of totally implantable central venous access ports.[20]

5.5. LIMITATIONS

This technology review has several limitations. The selection of studies was done by one reviewer. Although there was no restriction in language during the search but only English full text articles were included in this review. The longest follow-up period was six months.

6. CONCLUSION

There was fair level of retrievable evidence to suggest that antibiotic prophylaxis for chemoport insertion was not effective in reducing infection rates. In terms of safety, there was very limited retrievable evidence. However, severe nausea and vomiting were reported as adverse events in one study. There was no retrievable evidence on cost-effectiveness. Few international guidelines did not recommend the use of antibiotic prophylaxis in chemoport insertion.

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8. APPENDIX

8.1. Appendix 1: LITERATURE SEARCH STRATEGY

Epub Ahead of Print, In-Process & Other Non-indexed Citations, Ovid MEDLINES ® Daily and Ovid Medline ® 1946 to Present

1. catheterization, central venous/
2. catheterization*, central venous.tw.
3. catheterization*, central.tw.
4. venous catheterization*.tw.
5. central catheterization*.tw.
6. central venous catheterization*.tw.
7. 1 or 2 or 3 or 4 or 5
8. catheters, indwelling/
9. catheter*, in dwelling.tw.
10. catheter*, indwelling.tw.
11. (implantable or in-dwelling or indwelling) adj catheter*.tw.

12. 8 or 9 or 10 or 11
13. CENTRAL VENOUS CATHETERS/
14. catheter*, central venous.tw.
15. central venous catheter*.tw.
16. venous catheter*, central.tw.
17. 13 or 14 or 15 or 16
18. chemoport* insertion.tw.
19. implanted central venous access port*.tw.
20. implanted central venous device*.tw.
21. implanted vascular access device*.tw.
22. implanted venous access device*.tw.
23. chemotherapy port*.tw.
24. chemoport*.tw.
25. totally implantable venous access device*.tw.
26. implantable port*.tw.
27. implanted port placement.tw.
28. infusion port*.tw.
29. port-a-cath.tw.
30. 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
31. 7 or 12 or 17 or 30
32. ANTIBIOTIC PROPHYLAXIS/
33. (antibiotic adj (premedication* or prophylaxis)).tw.
34. 32 or 33
35. 31 and 34

OTHER DATABASES	
EBM Reviews - Cochrane Central Register of Controlled Trials	Same MeSH, keywords, limits used as per MEDLINE search
EBM Reviews - Cochrane database of systematic reviews	
EBM Reviews - Health Technology Assessment	
EBM Reviews – NHS Economic Evaluation Database	
EMBASE	
INAHTA website	totally implantable port

Pubmed

Search ((((((((((((((((((((((((((CATHETERIZATION CENTRAL VENOUS[MeSH Terms]) OR catheterization* central venous[Text Word]) OR catheterization* central[Text Word]) OR venous catheterization* central[Text Word]) OR central catheterization*[Text Word]) OR central venous catheterization*[Text Word]) OR CATHETERS INDWELLING[MeSH Terms]) OR catheter* in dwelling[Text Word]) OR catheter* indwelling[Text Word]) OR implantable catheter*[Text Word]) OR in dwelling catheter*[Text Word]) OR in-dwelling catheter*[Text Word]) OR indwelling catheter*[Text Word]) OR CENTRAL VENOUS CATHETERS[MeSH Terms]) OR catheter* central venous[Text Word]) OR central venous catheter*[Text Word]) OR venous catheter* central[Text Word]) OR chemoport* insertion[Text Word]) OR implanted central venous access port*[Text Word]) OR implanted central venous device*.[Text Word]) OR implanted vascular access device*.[Text Word]) OR implanted venous access device*.[Text Word]) OR chemotherapy port*.[Text Word]) OR chemoport*[Text Word]) OR totally implantable venous access device*.[Text Word]) OR implantable port*.[Text Word]) OR implanted port placement[Text Word]) OR infusion port*[Text Word]) OR port-a-cath[Text Word]

8.2. Appendix 2

DESIGNATION OF LEVELS OF EVIDENCE

I Evidence obtained from at least one properly designed randomized controlled trial.

II-I Evidence obtained from well-designed controlled trials without randomization.

II-2 Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or research group.

II-3 Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of the introduction of penicillin treatment in the 1940s) could also be regarded as this type of evidence.

III Opinions or respected authorities, based on clinical experience; descriptive studies and case reports; or reports of expert committees.

SOURCE: US/CANADIAN PREVENTIVE SERVICES TASK FORCE (Harris 2001)

8.3. **Appendix 3**

Evidence Table: Efficacy / effectiveness
Question: How effective is the antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
1. Ljungman P, Hagglund H, Bjorkstrand B, Lonnqvist B, Ringden O. Peroperative teicoplanin for prevention of gram-positive infections in neutropenic patients with indwelling central venous catheters: a randomized, controlled study. Support Care Cancer 1997;5(6):485-8.	Prospective, randomised open study Inclusion criteria: 1.18 - 82 years 2.scheduled for placement of a central venous catheter for the treatment od acute leukemia or aplastic anemia or prior to allogeneic or autologous stem cell transplantation 3.expected to develop neutropenia ANC >0.5x10^9/L at least 7 days 4.chemotherapy starts within 7 days after the insertion of catheter. Exclusion criteria: 1.fever at the time of catheter insertion 2.allergy to vancomycin or teicoplanin 3.antibacterial chemotherapy within 48 h before the start of the study, with the exception of prophylactic ciprofloxacin or trimethoprim-sulfamethoxazole.	II-2	-66 patients were included in this study -1 patient was lost to follow-up, 3 patients violated the protocol -62 patients were analysed (32 in teicoplanin arm & 30 in control group) -There were no significant difference in any of the characteristics The median age of patients in teicoplanin arm was 45 years (range 19-72 years) The median age of patients in control arm was 39 years (range 18-60 years)	IV teicoplanin one dose before surgery, if surgery was delayed for more than 6 hours, an additional dose of teicoplanin was administered. Dose of teicoplanin were based on body weight: 1.<55.0kg (300mg) 2.55.0-74.9kg (400mg) 3.≥75.0kg (500mg)	no antibiotic	21 days from the day of inclusion into the study	Infection episodes -15/32 (47%) patients in teicoplanin arm developed infections -11/30 (37%) patients in control arm develop infections Table 2 : Classification and distribution of infection episodes Classification of episode / Teicoplanin / Control / P-value Microbiologically documented gram-positive infection 10 6 ns Microbiologically documented other infection 2 0 ns Clinically documented catheter associated infection 1 2 ns Clinically documented other infection 2 3 ns Total documented infection 15 11 ns Unexplained fever 9 8 ns Total infection episodes 24 19 ns **Table 3** Documented bacteremias Bacteremia (agent) / Teicoplanin / Control Coagulase negative staphylococci 7 2 *S. aureus* 2 0 *S. mitior* 0 4 *E. coli* 1 0 *Stomatococcus mucilaginosus* 1 0	method of randomization and allocation concealment was not stated patients and assessors were not blinded per protocol analysis

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
	CVC were inserted under local anesthesia in the operating room.							

Evidence Table: Efficacy / effectiveness
Question: How effective is the antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
2. Di Carlo I, Toro A, Pulvirenti E, Palermo F, Scibilia G, Cordio S. Could antibiotic prophylaxis be not necessary to implant totally implantable venous access devices? Randomized prospective study. Surgical oncology. 2011;20(1):20-5.	Randomised prospective study did not specify randomisation Aim: to evaluate the role of the antibiotic in the prevention of the infection of both surgical site and the TIVAD within 30 days of after the implant. 108 consecutive patients were enrolled. TIVADs were implanted surgically in cephalic vein. On the first, third and seventh postoperative days, the following manifestations were considered as signs or symptoms of infection: pain, localised swelling, redness, and heat; white blood cell count was performed in the in-hospital laboratory. Body temperature were checked twice a day for 7 days. Inclusion Criteria: 1.good performance status 2.>18 years 3.diagnosis of solid tumors 4.WBC between 4 x	II-2	108 patients were enrolled and were divided into two groups ; 54 in group A (antibiotic), 54 in group B (no antibitotic) There were no significant difference in patients' perioperative characteristics in terms of sex, age, diabetic status, smoking status and chemotherapy.	1 g of ceftazidime administered IV 10 min before the skin incision	no antibiotic		Surgical site infections (SSIs) are classified as either incisional or organ/space involving. Incisional SSIs : 1. Superficial insicional SSIs (involving only skin and subcutaneous tissue 2. Deep incisional SSIs (involving deeper soft tissues of the incision) Infection was considered if the following signs and symptoms occurred within 30 days after the surgical procedure: 1. A body temperature >37.5ºC 2. WBC > 10 x10^9/L 3. ≥ 1 of the following - Pain - Localised swelling redness - heat Author's conclusion: Not to administer IV antibiotic prophylaxis before TIVAD placement. Admitting patients to the hospital after TIVAD placement may have resulted in exposure to nosocomial pathogens and increased risk,	did not specify randomization method participants were not blinded

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
	10^9/L and 10 x 10^9/L 5.Body temperature lesser than 37ºC Exclusion criteria: 1.Clinical symptoms of infection							

Evidence Table: Efficacy / effectiveness
Question: How effective is antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
3. Karanlik H, Kurul S, Saip P, Unal ES, Sen F, Disci R, et al. The role of antibiotic prophylaxis in totally implantable venous access device placement: results of a single-center prospective randomized trial. American journal of surgery. 2011;202(1):10-5.	Single-center, prospective randomised, double-blind, placebo controlled trial The aim of the study was to assess whether prophylactic antibiotics could reduce the rate of surgical site infections (SSI) after insertion of totally implantable venous access devices (TIVAD) 404 patients (203 received prophylactic cefazolin, 201 received a placebo) undergone TIVAD insertion. Infections were evaluated 3, 7, 14, and 30 days after discharge and outcomes were compared and analysed. inclusion criteria: all patients referred to the authors for TIVAD insertion between September 2008 and December 2009 exclusion criteria: 1.Patient refused to participate 2.Lack of compliance 3.Participate in another	II-2	432 consecutive patients who met criteria for TIVAD implantation (between September 2008 and December 2009) 15 patients were excluded 404 patients were analysed Mean age was 53.1 ± 11.5 years in the antibiotic group and 53.5 ± 12.4 years in the placebo group.	203 received prophylactic cefazolin	201 received placebo -	Patients were followed up at 3, 7, 14 and 30 days after discharge.	Wound infection were categorized as 1. Superficial SSI 2. Deep SSI **Table 2** Details of patients with infection from a group of 404 patients after TIVAD surgery randomized between antibiotic prophylaxis and placebo | Patient no.	Allocation group	Age, y	Sex	Postoperative day detected	Microorganism cultured	Type of infection	Treatment	Outcomes
1	Placebo	27	F	5	S epidermidis	SSSI	Drainage, antibiotics	Recovered
2	Placebo	47	F	7	No culture	SSSI	Antibiotics	Recovered
3	Antibiotic	52	M	7	No culture	SSSI	Antibiotics	Recovered
4	Placebo	53	F	7	No culture	SSSI	Drainage, antibiotics	Recovered
5	Placebo	56	M	12	S aureus	SSSI	Drainage, antibiotics	Recovered
6	Placebo	58	F	5	No culture	SSSI	Antibiotics	Recovered
7	Antibiotic	60	M	10	S aureus	DSSI	Drainage, antibiotics	Port removed
8	Antibiotic	66	M	5	No culture	SSSI	Antibiotics	Recovered
9	Antibiotic	40	F	7	No culture	SSSI	Drainage, antibiotics	Recovered
10	Placebo	65	F	5	No culture	SSSI	Antibiotics	Recovered
11	Antibiotic	49	M	8	No culture	SSSI	Antibiotics	Recovered	 DSSI = deep surgical site infection; SSSI = superficial surgical site infection. No risk factors contributing to SSI could be found in this study. The absence of prophylactic antibiotics also did not increase the risk of SSIs. The results showed that the overall rate of SSIs after TIVADs insertion was 2.7%, and it was comparable with the results from the literature. Authors' conclusion: Preoperative administration of single-dose cefazolin for TIVAD insertion does not decrease the risk of wound infection. The result does not support the use of antibiotic prophylaxis for TIVAD insertion.	

	intervention 4.Impaired mental status 5.WBC <4000 6.Allergic to antibiotic 7.Patient with diabetes mellitus 8.Patient expected to receive radiation to their neck and upper thoracic region after insertion Randomization was done by a computer-generated code by a nurse who also prepared the sealed antibiotic or placebo syringes. She was unaware of the study and was never involved in surgery, data collection, or patient follow-up evaluation. All of the TIVAD were introduced in a daytime and a single type of port system (Braune Celsite ST301; Melsungen, Germany) was used. All TIVAD were inserted via subclavian vein puncture method. A thoracic radiograph was performed to assess for immediate morbidity and catheter tip position.							

Evidence Table: Efficacy / effectiveness
Question: How effective is antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
4. Scaife CL, Gross ME, Mone MC, Hansen HJ, Litz CL, Nelson ET, et al. Antibiotic prophylaxis in the placement of totally implanted central venous access ports. American journal of surgery. 2010;200(6): 719-22; disussion 22-3.	Cohort, single-centre study Aim/objective: to compare the rate of catheter-related infections with and without perioperative antibiotics Methods: -459 patients underwent surgical placement of implanted central venous access ports (CVAPs) to facilitate the administration of chemotherapy -All procedures were performed by 2 surgeons at a single, university-based center. The surgical technique for placement of the CVAP was similar between surgeons. -Standard sterile technique techniques were used and skin was prepared with chlorhexidine. -Intraoperative fluoroscopy was used in all cases to confirm correct anatomic catheter placement. -One surgeon	II-3	458 patients (33% breast cancer, 15% colorectal cancer, 8% gynaecologic cancers, 44% other malignancies)	103 patients received antibiotics -cefazolin (89) -levofloxacin (6) -cefoxitin(1) -clindamycin(4) -piperacillin & tazobactam (1) -cefazolin & clindamycin(1) -cefazolin & gentamicin (1)	356 patient did not received antibiotics	30 days after insertion	Age, BMI, diabetes diagnosis, female sex, preprocedure WBC, procedure-related complication rate or procedure time were not significantly different in comparing groups with and without infections. 9/356 CRI occurred in the group that did not receive perioperative antibiotic (P = 0.218) Factors that were associated significantly with CRI: 1. Subclavian vein placement (P = 0.005) 2. Multiple insertion site attempts (P = 0.018) **Table 2** Comparison between infection groups | | Infection (n = 9) | No infection (n = 449) | *P* value* | |---|---|---|---| | Subclavian placement rate, % | 44.4 (4/9) | 8.4 (38/450) | .005 | | Insertion site attempts | 1.67 ± 1.3 | 1.13 ± .4 | .018 | | BMI | 27.2 ± 4.1 | 27.5 ± 6.7 | .77 | | Diabetes diagnosis rate, %† | 22.2 (2/9) | 11.5 (52/450) | .29 | | Age, y | 52.6 ± 19.0 | 55.9 ± 14.0 | .78 | | Female sex, % | 55.6 | 66.2 | .49 | | Preprocedure WBC, k/μL | 8.1 ± 2.7 | 7.2 ± 3.5 | .26 | | Complication rate, % | 0 | 2.0 | .99 | | Procedure time, min | 30.2 ± 14.1 | 29.8 ± 12.6 | .99 | *Chi-square analysis with the Fisher exact test and the Mann-Whitney *U* test. †Both insulin and noninsulin diabetes diagnosis. Authors' conclusion: A single dose of prophylactic antibiotics may decrease the incidence of CRIs for CVAPs. Antibiotic use is justified based on equivocal rates of infection but devastating infection-related complications and costs.	Antibiotic placed were based on surgeon preferences – introduces bias

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
	routinely treated patients with a single dose of antibiotic, the other one did not routinely use antibiotic prophylaxis. -Catheter-related infection(CRI) was defined as either induration in the surgical site that resulted in antibiotic treatment, positive blood cultures, or suspicion of infection that led to CVAP removal within 30 days of insertion. -Patient were excluded from this study if they were receiving antibiotics before the procedure.							

Evidence Table: Efficacy / effectiveness
Question: How effective is antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
5. Covey AM, Toro-Pape FW, Thornton RH, Son C, Erinjeri J, Sofocleous CT, et al. Totally implantable venous access device placement by interventional radiologists: Are prophylactic antibiotics necessary? Journal of Vascular and Interventional Radiology. 2012;23(3):358-62.	Cross-sectional study Aim : to determine the rate of early infection for totally implantable venous access device placed without antibiotic prophylaxis. All patients who underwent totally implantable venous access device placement (1January 2009 till 31 December 2009) were obtained from the patient archiving communication system(PACS). The list was cross-referenced to all patients who underwent TIVAD removal from 1 January 2009 till 30 January 2010 to identify TIVAD that were removed within 30 days of placement. Retro spective chart review was performed to record patient demographics, including age, sex, cancer diagnosis, and indication for removal. Concurrent antibiotic therapy, chemotherapy, and laboratory data before	II-3	1183 implantable ports were placed in 1167 patient. 2 implantable ports were place in 16 patients. Mean age was 59.2 years (range 16-92 years) -717 women -467 men Breast cacner, colorectal cancer, lymphoma, and pancreatic carcinoma were the most common diagnoses.	antibiotic prophylaxis	no antibiotic prophylaxis	30 days	81 (6.8%) patients received prophylaxis antibiotic on the day of implantation 63 (5.9%) patients received antibiotics at the time of port placement for reasons unrelated to prophylaxis for TIVAD placement 18 (1.5%) patients were neutropenic at the time of TIVAD placement (ANC <1) and were administered with a prophylactic IV dose of cephalexin 1 hour before the procedure. 12/13 ports were removed within 30 days of placement due to suspected or known infection. 1/13 port was removed and replaced because the catheter tip had migrated from the superior vena cava into the internal jugular vein. No patients who received an antibiotic prior to TIVAD insertion developed CLABSI within 30 days of placement. Author's conclusion: Not to administer antibiotic prophylaxis for TIVAD placement because of the extremely low infection rate with or without antibiotics.	type of antibiotics not stated lack of formal antibiotic arms

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
	and within 30 days of placement were recorded. Central line-associated bloodstream infections (CLABSIs) were identified using US Centers for Disease Control and Prevention (CDC) criteria. 1.one positive culture for nonskin flora 2.two positive cultures for skin flora							

Evidence Table: Efficacy / effectiveness
Question: How effective is antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
6. Nelson ET, Gross ME, Mone MC, Hansen HJ, Nelson EW, Scaife CL. A survey of American College of Surgery fellows evaluating their use of antibiotic prophylaxis in the placement of subcutaneously implanted central venous access ports. American Journal of Surgery. 2013;206(6): 1034-40.	cross-sectional study Aim: to determine the current practice pattern of prophylactic antibiotics in fully implanted central venous access ports placement among fellows of the American College of Surgeons A single-page survey consists of 18 questions was submitted and approved by the Institutional Review Board. 20,563 of American College of Surgeons membership addresses were provided and 5000 representative sample were taken from there using computer generated program. Surgeons on the list were sent a copy of the single-page survey along with the protocol consent form and a stamped return envelope. Surveys were mailed in November 2010 and returned through	II-3	the response rate was 21.7% (1,080 of 4,979) There were respondents from all 59 states and the District of Columbia, plus military members. When the addresses of respondents were broken down into US census regions, there was a response rate of >20% from each region (Midwest, Northeast, South, West and Military)	antibiotic prophylaxis	no antibiotic prophylaxis	NA	Practitioners who placed central venous access ports in clinics or minor procedure rooms were likely to use prophylactic antibiotic for central venous access port placement. Surgeons who preferred the subclavian vein over internal jugular vein were less likely to use prophylactic antibiotic. All other factors, including type of practice, years in practice and estimated catheter-related infection, did not affect the rate of prophylactic antibiotic. The definition of catheter-related infection provided in the survey questions was "induration in the operative site that resulted in antibiotic treatment, OR positive blood cultures, OR suspicion of infection which led to line removal within 30 days of catheter insertion'. Regardless of their prophylactic antibiotic use practice patterns, the majority of respondents (76%) chose the answer for "their estimated catheter-related infection rate" as <1%, when offered choices of <1%, 1% to 5%, 6% to 10%, >10%, and "do not know." Univariate analyses showed that there was no significant difference in chosen catheter-related infection (<1% or ≥1%) on the basis of the number of years placing ports (<10 vs ≥10 years, 75.8% vs 75.6%, respectively; P = 0.96) or for the estimated number of central venous access ports placed in a year (<20 or ≥20, 76.2% vs 74.8%, P = 0.65). There was, however, a statistical difference in the choice of infection rate and practice setting, with academics choosing ≥1% at a rate of 31.3% compared with nonacademics at 22.6% (P = 0.02). The higher infection rate of ≥1% was chosen more often by respondents who chose the internal jugular vein as their preferred placement site, with 32.5% compared with 21.8% for those who preferred the SCV (P = 0.002). Using logistic regression, they compared the estimated catheter-related infection rate of <1% versus ≥1%; those in academic settings had an odds ratio of 1.74 for choosing	Low response rate, selection bias since mostly placed central venous access ports.

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
	March 2011. Returned surveys were examined for completion, and all survey with >50% of questions completed were included in the analysis.						the higher catheter-related infection of ≥1%, and those who used the IJV as the primary placement site had an odds ratio of 1.48 for choosing ≥1%.	

Evidence Table: Safety
Question: How safe is antibiotic prophylaxis in chemoport insertion?

Bibliographic citation	Study Type / Methodology	LE	Number of patients and patient characteristics	Intervention	Comparison	Length of follow up (if applicable)	Outcome measures/ Effect size	General comments
1. Raad, II, Hachem RY, Abi-Said D, Rolston KV, Whimbey E, Buzaid AC, et al. A prospective crossover randomized trial of novobiocin and rifampin prophylaxis for the prevention of intravascular catheter infections in cancer patients treated with interleukin-2. Cancer. 1998;82(2):403-11.	Prospective crossover randomised trial Aim: to determine the efficacy of novibiocin and rifampin as oral prophylaxis for the prevention of catheter-related infection in melanoma patients treated with interleukin-2 plus interferon alpha and chemotherapy Objective: compare the incidences of infection experienced by the group that received oral antibiotic and the control group. Patients with advanced melanoma who were treated with biochemotherapy at the University of Texas M.D. Anderson Cancer Center were randomized in a crossover study to receive either oral antibiotic prophyalxis consisting of novobiocin and rifampin or observation alone over a 35-day course period. Patients were subsequently "crossed over" to the	II-2	Patients were randomised in a crossover study to either received prophylactic antibiotics or be observed only. The prophylactic were given within 48 hours after the initiation of biochemotehrapy. 26 patients were involved in this study 12 were randomized to receive prophylactic antibiotics during the first course of biochemotherapy and observation only during the second course. 14 patients were randomized to the control group randomized to the control arm during first course and to the prophylactic antibiotics arm during the second course. The demographics of the two group	novobiocin 500mg plus rifampin 300mg given orally every 12 hours over a 35 days.	no antibiotic	35 days	71% of the 17 evaluable patients developed at least one infectious complication during the control course. 12% (2/17) of the same patient population developed an infection during antibiotic prophylaxis (p= 0.0001). Catheter related infection occurred in 65% (11/17) of the evaluable patients during control course (p= 0.0002). Nine patients (35%) failed to tolerate the oral antibiotic regimen because they developed severe nausea and vomiting during the course of treatment, resulting in discontinuation of the antibiotics.	

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	opposite arm of the study for an additional 35-day period, with each serving as his or her own control. Patients were excluded form the stusy if they had a hypersensitivity to either novobiocin or rifampin, younger than 16 years old, were pregnant, had a documented systemic bacterial infection, were receiving systemic antibiotic, had impaired hepatic function, were unable to take oral medications or were eligible to receive at least 2 courses of biochemotherapy		were comparable with regard to age and gender.					