Preventing Contaminated (False Positive) Blood Cultures

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Objectives

- Define false positive blood culture
- State the consequences of false positive blood cultures
- List proper techniques to prevent a false positive blood culture
- Describe importance of timing and amount in obtaining blood culture specimens
- Select the appropriate blood culture bottles

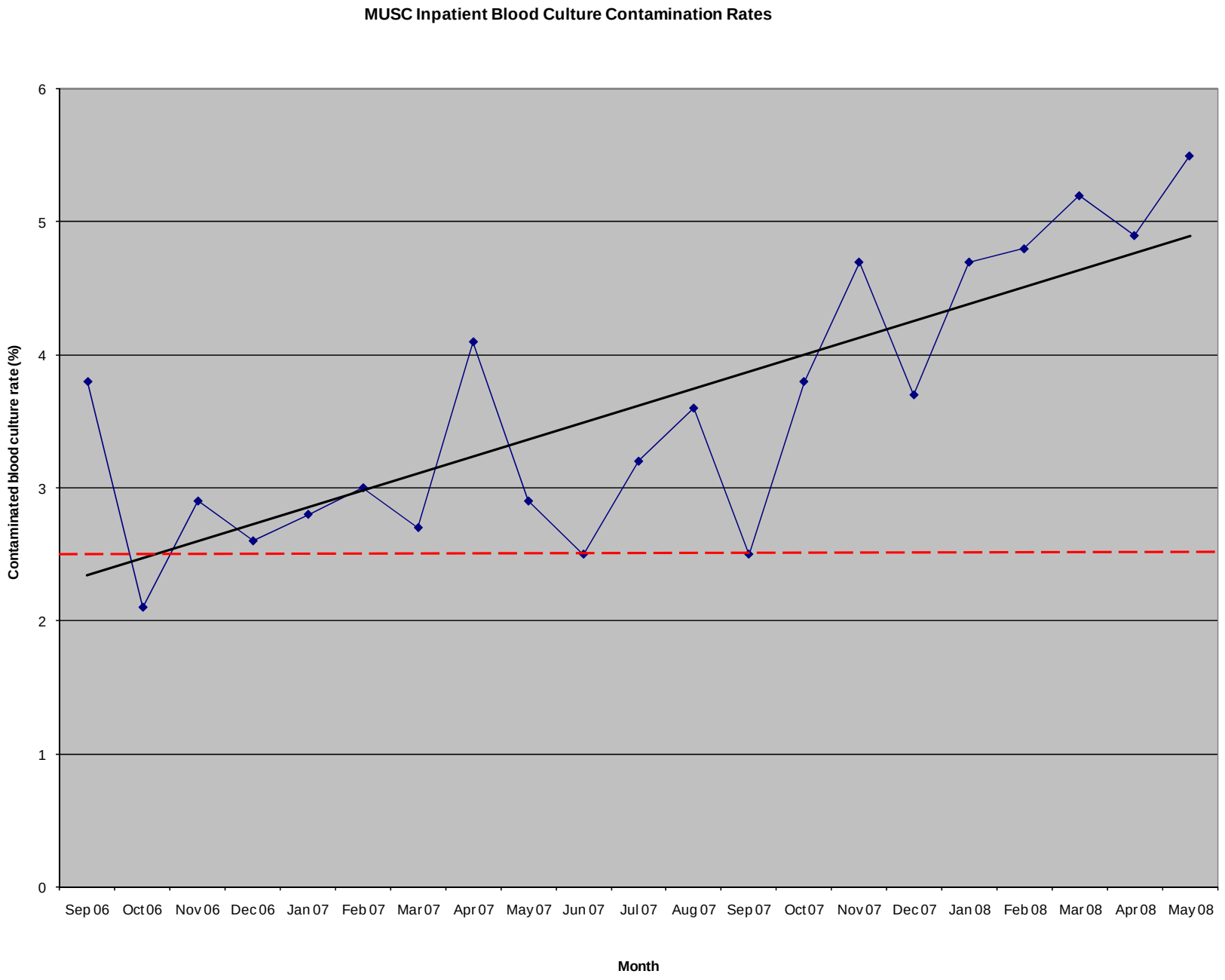
Blood culture definitions

- Blood culture or Blood culture set = volume of blood obtained under aseptic conditions that is inoculated into one or more bottles of broth culture medium

- Positive culture = one or more bottles of a blood culture set demonstrate(s) growth

What is the Problem?

- The problem is numbers of contaminated (false positive) blood cultures obtained at MUHA
- A false positive means that a blood culture contains an organism from a source other than the patient's blood, i.e. skin or environmental organisms
- When this occurs a patient may be treated unnecessarily when there is NO bloodstream infection.


MUSC Inpatient Blood Culture Contamination Rates
Contaminated blood culture rate (%)
0
1
2
3
4
5
6
Sep 06
Oct 06
Nov 06
Dec 06
Jan 07
Feb 07
Mar 07
Apr 07
May 07
Jun 07
Jul 07
Aug 07
Sep 07
Oct 07
Nov 07
Dec 07
Jan 08
Feb 08
Mar 08
Apr 08
May 08
Month

Unit Specific Data
May, 2008

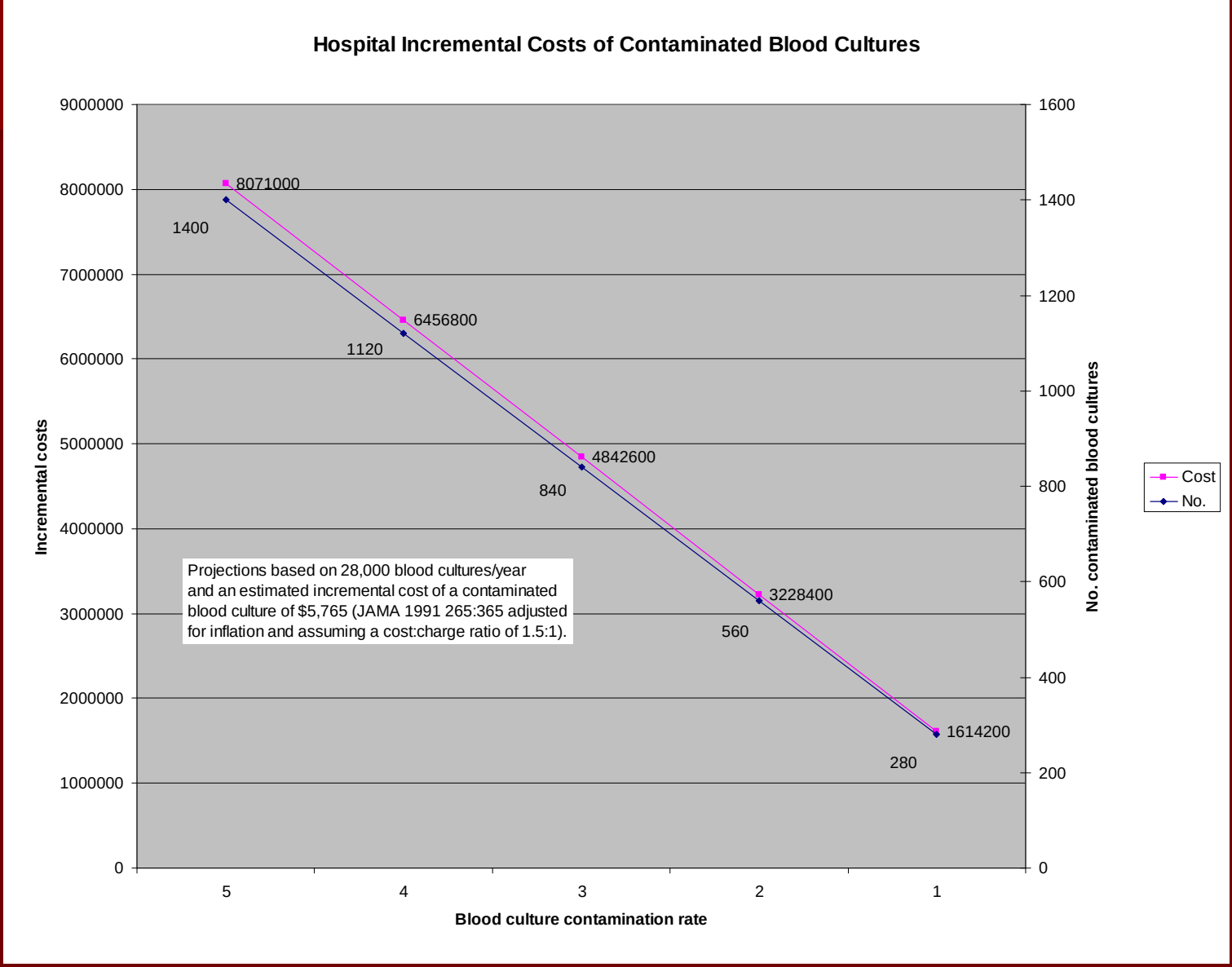
Anony-mous MUSC units	Total # contam	Total # drawn	% contam	Contam periph nursing	Total # periph	% contam periph draws	Contam line nursing	Total # line draws	% contam line draws
A	4	68	**5.9**	3	45	**6.7**	1	23	**4.3**
B	5	121	**4.1**	1	39	2.6	4	82	**4.9**
C	3	32	**9.4**	1	16	**6.3**	2	16	**12.5**
D	3	25	**12**	2	19	**10.5**	1	6	**16.7**
E	5	94	**5.3**	2	65	**3.1**	3	29	**10.3**
F	3	54	**5.6**	1	11	**9.1**	2	43	**4.7**
G	0	30	0	0	25	0	0	5	0
H	2	59	**3.4**	2	43	**4.7**	0	16	0

rate of $\leq$ 3% OK

Economic impact of false positive blood cultures

- Each contaminated blood culture results in about $6,000 extra in healthcare costs (JAMA 1991 265:365)
- Vascular catheter-associated infections not paid for by Medicare as of October 1, 2008, if they are sole major complicating condition
- Adversely affects reportable bloodstream infections rate (Hospital Infections Disclosure Act [HIDA])
  - CDC considers false positives within a 2 day period a true infection for reporting purposes.

Estimated Annual Hospital Incremental Costs by Contamination Rate



Patient/Staff impact of false positive blood cultures

- More blood cultures collected to resolve diagnostic dilemma
  - More work for nursing/phlebotomy/lab
  - Increased patient discomfort
- Inappropriate antimicrobial therapy
  - Potentially miss true pathogen of infection
  - Unnecessary drug levels, drug administration, *C difficile* associated diarrhea (isolation)
  - Increased risk of developing multi-drug resistance (MDR) MRSA, VRE, etc. (isolation)

Occurrence of False Positive Blood Cultures

	True infection (%)	Contamina-tion (%)	Maybe (%)
S. aureus	87	6	6
Coag negative staph	12	82	6
Enterococcus	70	16	14
Diphtheroids	2	96	2
C. perfringens	23	77	
C. albicans	90		10

Question 1

What is considered a false positive blood culture?

a. Aerobic growth in specimen when an anaerobe is expected

b. The specimen is contaminated with an organism that is from a source other than the patient’s blood.

c. Specimen positive for MRSA

d. Specimen positive for VRE

Blood culture collection issues

- Volume
  - THE MOST IMPORTANT variable in detecting bacteremia and fungemia
  - Collect MAXIMUM volume for pt weight & bottle type
- Timing
- Antiseptic site prep
- Site of collection
  - Venipuncture (one set must be peripheral site)
  - Line draws (avoid if possible)
  - Site must be documented on lab requisition

How much blood to draw per set?

Pt wt (lbs)	Total bld vol*	Draw for cult #1*	Draw for cult #2*	Total vol bld cult*	% total bld vol
<2.2	50-99	1.5	0.5	2	4
2.2-4.4	100-200	3	1.5	4	4
4.5-27	>200	3	3	6	3
28-80	>800	5/5	5/5	20	2.5
>80	>2,200	10/10	10/10	40-60	1.8-2.7

*(ml)

What to do if less than the desired amount of blood is collected?

- If less than the recommended volume of blood is collected for culture, the blood should be inoculated into the AEROBIC bottle first, maximizing the volume, then into the anaerobic bottle
  - Most bacteremias are caused by aerobic bacteria
  - Yeast are aerobes and grow almost exclusively in aerobic bottles

Timing for Drawing Blood Culture Sets

- For most clinical indications, 2 blood culture sets should be drawn as quickly as possible so antibiotics can be started.
  - No difference in microbial recovery cultures drawn immediately after each other vs 15, 30, or 60 min apart
  - Timing can be as quick as good disinfection can be performed!
  - Exceptions: endocarditis, endovascular infections
  - Two positive cultures drawn more than 2 hrs apart that grow an organism usually considered a contaminant will not be considered a bloodstream infection
    - Sensitivities are NOT done unless the physician consults with Dr Steed.

Question 2

What is the minimum time necessary between drawing blood culture sets for clinical indications other than endocarditis or an endovascular infection ?

a) Immediately start second disinfection process
b) 15 minutes, then start second disinfection process
c) 30 minutes, then start second disinfection process
d) 2 hours, then start second disinfection process

Question 3

The most important variable in detecting bacteremia and fungemia is the volume of blood collected

a. T
b. F

Question 4

Which of the following are consequences of false positive blood cultures?

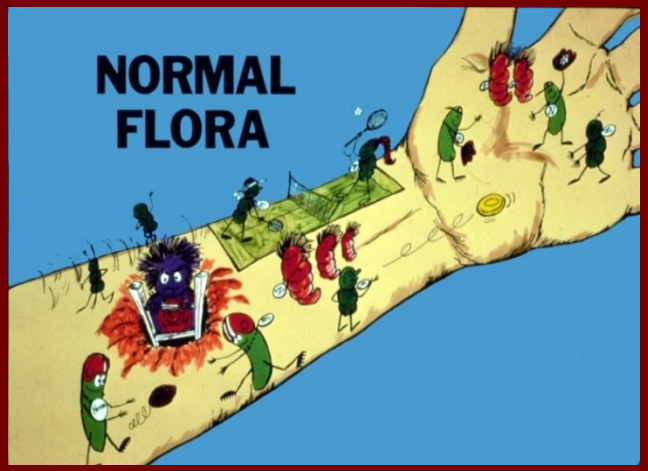
a) Each contaminated blood culture results in about $6,000 extra in healthcare costs
b) Inappropriate antimicrobial therapy
c) Increase in reportable bloodstream infections rate (Hospital Infections Disclosure Act [HIDA])
d) d. All of the above

Blood culture bottle antiseptic preparation

- Remove the protective cap from the blood culture bottles.
- Tops of bottles are NOT STERILE
- Disinfect the tops of the blood culture bottles by wiping with an alcohol pad for 1-2 seconds (do not use iodine/iodophor)
- Allow alcohol to air dry for 60 seconds
  - Do not speed alcohol drying by fanning, waving bottles, blowing across the bottles, etc. as this re-contaminates the bottle top.

Skin antiseptic preparation

- Peripheral blood culture:
  - Disinfect the site with ChloraPrep® using friction for ***30*** seconds & dry for ***30*** seconds
  - Do not speed ChloraPrep® drying by fanning, waving bottles, blowing across the bottles, etc. as this re-contaminates the surface.
  - **Do not** re-palpate the site to relocate vessel



Intravascular line antiseptic preparation

- Intravascular line blood culture:
  - Use SmartSite® valve closest to insertion site
  - ChloraPrep® the SmartSite® valve using friction for **30 seconds**
    - **Do not use alcohol**
  - Allow to air dry for **30 seconds**
  - Do not speed ChloraPrep® drying by fanning, waving bottles, blowing across the bottles, etc. as this re-contaminates the hub.
  - Collect blood
    - *Do not discard* initial blood draw. This blood can be used for culture. Bacteria have adapted to the heparin

Why Let ChloraPrep® and Alcohol Dry?

Drying Time is Dying Time!

- Microorganisms are killed only when the antiseptic dries.
- Hurrying is not an option!

Blood Culture Reminders

- Higher contamination from ports/lines
- Disinfect ports/lines with ChloraPrep®
- SEND A VENIPUNCTURE blood culture when a line blood culture is sent
  - *2 line draws is **not** equivalent to a venipuncture*
- Why can we use the <u>initial</u> blood draw for blood cultures?
  - Bacteria have adapted to the heparin
- Maximize the volume of blood in the bottles

Question 5

What is(are) the proper decontamination technique(s) to prevent false positive blood cultures when drawing from a venipuncture?

a. Prep top of culture bottle for 1-2 seconds with alcohol and allow to dry for 1 minute
b. Prep skin with ChloraPrep® using friction for 30 seconds then allow ChloraPrep® to dry for 30 seconds
c. Do not repalpate vein.
d. All of the above

Question 6

Proper techniques for preventing false positive blood cultures when drawing from an IV line include

a. Use SmartSite® valve closest to insertion site
b. ChloraPrep® blue portion of SmartSite® valve using friction for 30 seconds & allow to air dry for 30 seconds
c. Do not discard initial blood draw. This specimen should be used for culture.
d. All of the above

Selecting Blood Culture Bottles

For use with patients weighing 28 lbs or more

- Blue Standard Aerobic
- Purple Standard Anaerobic
  - Bottles draw 5-10ml
  - Draw blood volume appropriate for weight of patient
  - Be careful to not let the aerobic bottle overfill itself.
    - Overfilling affects the blood instrument.

Selecting Blood Culture Bottles

- For patients weighing up to 27 lbs
  - Yellow (pediatric)
    - Bottle draws up to 4ml
    - Draw blood volume appropriate for weight of patient
- For use with patients weighing 28 lbs or more
  - FAN (Activated charcoal) bottles should be used only **when ordered by practitioner**
    - Orange
    - Green
      - Bottles draw 5-10ml
      - Draw blood volume appropriate for weight of patient

Sites to draw blood cultures from

- Two peripheral blood cultures are most desired specimens to collect. (Best practice)
- If a physician wants a blood culture via an intravascular line, a peripheral blood culture collected at the same time is strongly encouraged. (Best practice)
- If a physician wants a blood culture ONLY via intravascular lines and there are 2 such lines, collect one culture from each line.
- If a physician orders a blood culture ONLY via intravascular lines and there is only 1 line with multiple ports, collect one culture from 2 different ports a few minutes apart.
- If a physician orders a blood culture ONLY via intravascular lines and there is only 1 line with only 1 port, collect one culture, wait a few minutes, disinfect and draw the second culture.

Question 7

A physician order is needed to use adult FAN culture bottles (orange and green)

a. T
b. F

Drawing blood cultures & other blood work

- Draw blood cultures first then draw other blood work
- Disinfection critical for blood cultures but won’t affect other blood work
- The initial blood draw (waste) may be used for blood cultures