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VA Pittsburgh Healthcare System

I. Identification of MRSA Carriers

Knowing who is a MRSA carrier is the first step in containing the reservoir to prevent spread.

A. Use of electronic patient record

The VA's Computerized Patient Record System (CPRS) provides a note in the upper right corner of the entry screen to each patient record. This note identifies the need for contact precautions under the *Crisis Warnings, Allergies and Advanced Directives (CWAD)*. Clicking on this note brings up instructions to maintain appropriate isolation precautions.

The CWAD note for contact precautions is activated by the Infection Control Practitioner (ICP) based on laboratory culture results. Any patient with a prior positive MRSA culture has a warning placed on their CPRS record. This warning remains on the record and serves as a reminder to re-swab later to see if the patient has cleared.

The ICP also places CWAD's on all patients from healthcare facilities outside the Pittsburgh VA system whose cultures are tested as MRSA-positive MRSA by the University Drive Hospital lab. These warnings alert staff if these carriers ever visit University Drive in the future.

B. Use of Unit Lists of MRSA carriers

A consolidated list of all patients identified as MRSA carriers within the last two years is queued to automatically to print daily on every unit of the VA Pittsburgh Healthcare System (VAPHS). The unit Nurse Manager assigns someone to check against the list that all identified MRSA carriers are (i) isolated; (ii) have the correct precautions sign posted; and that isolation supplies like gowns, gloves and hand hygiene agents are immediately available to support staff compliance. A record of the isolation and stocking compliance rate is captured daily in the acute care facility and twice per week in the long-term care facility. This compliance data is reported to the Patient Safety Committee.

C. Nasal swabbing on unit admission

VAPHS has been performing 100% admission and discharge nares swabbing in the 4-West Inpatient Surgery since November 2001 and in the Surgical Intensive Care Unit (SICU) since December 2003. Swabbing for nasal and wound carriage is performed when indicated in other units.

VAPHS plans to implement 100% nares swabbing of patients on admission and discharge to its University Drive acute care hospital and its Heinz Long Term Care facility in Aspinwall. The intent of this comprehensive swabbing is to enable healthcare workers to know and isolate all MRSA carriers. Combining both entry and exit swabbing will also enable the VAPHS to determine its nosocomial colonization rate.

D. Nasal swabbing of healthcare workers

The VAPHS employee health office makes elective nares swabbing available to its employees to determine nares colonization when indicated. However, the VAPHS does not perform routine nares surveillance on its healthcare workers to identify carriers.

Other studies have shown the potential for transient nares colonization of healthcare workers, who may start their shift uncolonized, pick up the organism during patient care, go home, then return the next day having cleared the colonization.

At this point the VAPHS' position is that if precautions are adhered to tightly, then no pick up and transmission should occur. Thus potential transient colonization by healthcare workers is not a priority at this time.

II. Isolation of patients

Immediate isolation of known and suspected MRSA carriers is an effective way to minimize the risk of spread to non-carrier patients. The best isolation layout minimizes the placement of both MRSA carriers and non-carriers on the same nursing circuit.

A. Floor plan for isolation

Having a plan in advance as to which rooms will be targeted to receive MRSA carriers and non-carriers helps to avoid the rework of moving patients after a misplacement. Some long-term care units that care for many MRSA carriers have chosen to identify an entire hallway of the unit to receive MRSA carriers. The inpatient surgery unit has designated isolation rooms equipped with anterooms to be filled first with MRSA carriers, followed by standard rooms sharing the same hallway with the isolation rooms. Other open rooms are filled first before non-MRSA carriers are placed near MRSA carriers. Education of the nursing team and tight adherence to the placement plan can make isolation more effective and easier.

B. Procedure for isolating patients

Nurses who are receiving a patient for unit admission usually receive notification of a patient's need for contact precautions from the nursing

report from the transferring unit. If no prior information on R/O status is provided, the cover sheet in the patient's computerized patient record can also be quickly reviewed to determine required precautions. The admitting nurse is accountable for placing the patient in the correct level of precautions.

C. Single room preference

At the University Drive acute care hospital, the VAPHS attempts to provide a patient in contact precautions for MRSA with a private room and bath.

D. Cohorting rules

Patients who are carrying the same pathogen may be cohorted in double or quad-rooms when single rooms are not available. Patients who are non-carriers should generally not be cohorted with MRSA carriers.

E. Moving patients after they become known carriers

Patients who are not known from their record to be MRSA carriers are currently placed in standard precaution (no isolation) rooms. If and when their MRSA nares swab result is determined to be positive at 48-72 hours, the patient will be placed in contact precautions. The patient is then usually moved to an isolation room, if available, or a more suitable room for contact precautions.

F. Signage at patient rooms

The placement procedure requires the admitting nurse to immediately place a sign in the sign holder outside the patient's room alerting entrants to the required precautions. The location of sign holders is standardized throughout VAPHS to provide clear identification of precautions before healthcare workers enter a patient room or care area.

G. Movement of patients outside of their assigned patient room

Patients may move about the VA outside of their assigned room, provided all wound drainage is contained. Patients who carry MRSA present some risk of transmission to other patients. However, the VAPHS has currently elected to focus on the risk of healthcare workers transferring MRSA from patient to patient. Nurses are instructed to educate patients identified as MRSA carriers to perform hand hygiene regularly.

H. Consult flagging

All consults on patients with MRSA are flagged in the CPRS alerting therapists and doctors that the patient they are about to treat requires

contact precautions. These consult flags appear on the CPRS cover screen through which the consultant must pass to access the patient record.

I. Interaction between visitors and patients in patient rooms

Healthcare workers are instructed to encourage families and visitors to perform hand hygiene at least on entry and exit to their visit in the patient room. Families and other visitors are typically not required to gown and glove when visiting the patient. The only exception is when family or visitors assist with patient care requiring intensive contact like bathing or dressing changes. If a family member or visitor is having intensive physical contact with the patient, gowning and gloving is required and should be guided by the RN. Family and visitors are encouraged throughout their visit to perform hand hygiene when entering and exiting patient rooms.

III. Precaution Compliance

A. Hand hygiene

Achieving high compliance with hand hygiene is the first step in eliminating pathogen transmission and is thus a common element in all precautions. The VAPHS goes further than the CDC which recommends hand hygiene after all contact with the patient or the patient's environment. The VAPHS expects hand hygiene on entry and exit from a patient care area (e.g. a patient room), between patients in the same room and between procedures on the same patient. Hand hygiene should always be done prior to donning gloves to prevent contamination of the gloves. Finally, hand hygiene performed on exit from a room may count toward entry hand hygiene to the next patient care area, if the healthcare provider proceeds immediately to the next area and has no hand contact with other patients, staff or the environment.

Alcohol foam hand rub

Alcohol foam hand rub is the first line of defense against the spread of pathogens by hands. Since alcohol is more effective at reducing the bacteria count on hands than anti-microbial soap, and alcohol's anti-microbial effect persists longer, the VA encourages the predominant use of alcohol hand rub over soap and water. The probability that hand hygiene will occur at all before, during or after a patient encounter increases when healthcare workers have a habit of using alcohol hand rub. Thus the VA has mounted alcohol hand rub dispensers at the entrance to every patient room and care area. The VAPHS uses EcoLab's *Quick-Care Hand Foam* alcohol rub from Huntington Laboratories.

Antimicrobial Soap

When hands become soiled, anti-microbial soap must be used for at least 15 seconds of washing to remove the dirt and oils. Antimicrobial soap washing in place of alcohol hand rub is also required for hand hygiene after working with patients with *Clostridium difficile*.

The use of *anti-microbial* soap instead of regular soap has been mandated by the VA central office for hand washing. Every patient room or care area provides ready access to anti-microbial soap (with Triclosan) and hand washing facilities. Again, the use of alcohol hand rub is encouraged as the best method of hand hygiene whenever hands are not soiled. The VAPHS uses Steris' *Medicated Lotion Soap* as for its general purpose antimicrobial hand wash.

Skin Lotion

Steris Lotion Soft® Skin Conditioner is made available for healthcare worker skin maintenance. Bottles of the conditioner (15oz) are placed in mounted holders at defined locations in the units. Both the alcohol hand rub foam and the anti-microbial soap have hand lotion integrated into their formulas to condition skin while it disinfects.

B. Gloves

Powder-free latex gloves are provided in two sizes, medium and large, in all rooms. Work has been done in the inpatient medical and surgical units to relocate glove boxes to the optimal location where they are clearly visible on entry to the room. Glove boxes are marked to ensure that the right size gloves are replenished to the boxes. In addition to one box of medium and large gloves, intensive care units also have boxes for small, extra large sizes as well as a second medium box of gloves.

Powdered latex gloves are intentionally not provided because the powder can irritate the skin, contributing to dermatitis and higher bacteria colonization of the hands.

Again, hand hygiene is stressed *before* putting on gloves to prevent contamination of the gloves.

Latex-free and nitrile gloves are also available to staff who have special needs.

C. Gowns

Gowning is one of the distinguishing features of Contact Precautions. Sheer, yellow, fluid-resistant gowns are provided at the VAPHS for routine work in areas under contact precautions when no fluid exposure risk is expected. These fluid-resistant gowns are designed to prevent the

incidental pick up and deposit of pathogens from contact during a patient encounter.

Blue, fluid-impermeable gowns are worn whenever a fluid exposure risk is anticipated. Note that these fluid-impermeable gowns are required in both Standard Precautions and Contact Precautions *whenever a fluid exposure risk exists*.

Since putting on a gown requires several extra seconds, it is one step in Contact Precautions that is most neglected. Continuous engagement in attacking gown compliance at the VA has uncovered the following factors for successful gown compliance:

1. Immediate availability on entry - Any delay involving hunting for gowns will cause a significant decrease in gowning. Supply reliability is important to prevent the creation of individual work-arounds, such as having partial bags of gowns stashed throughout the work area -just in case.
2. Immediate visibility at the point of entry. Where ante rooms are available, cabinets containing gowns are clearly labeled inside and out. For isolation in rooms without anterooms, a yellow, four-drawer cabinet is placed beside the entrance of the patient room. The outside of the drawers are labeled with pictures of the supplies contained. The Heinz long-term care facility is installing clear Plexiglas boxes to hold gowns that will be visible from the room entry.
3. Fit – Prior to deploying the sheer yellow gowns, the VA supplied heavy green cloth gowns that came in one size and fit no one. Floor nurses managed the evaluation of alternative disposable fluid-resistant gowns to improve the fit. The current yellow gowns come medium and large sizes, though only the large size is stocked to the units. These large-sized fluid resistant gowns have proved to be adaptable at supporting coverage on a variety of body sizes.
4. Appropriate use – Believe it or not, some healthcare workers don gowns backwards like a coat, leaving their front side open. Others neglect to tie the neck and let the gown fall to mid-chest. Continuous training and awareness about the potential for pathogen pick up on an unprotected front side has reduced these forms of noncompliance.
5. Understanding the clinical case for gowns – There are convincing clinical studies that show MRSA transmission cannot be eliminated without using gowns to prevent healthcare workers'

clothing from becoming vectors for transmission. Beyond the scientific studies our experience suggests the presentation of a few photographs of culture dishes that show the pathogen pickup can occur on the lab coats of some prominent clinicians has been highly effective at communicating the need to gown.

D. Masks

Masks are used in Contact Precautions by some US hospitals to prevent colonization of the nares and subsequent transmission from the nares to non-carriers. Healthcare workers with runny noses are obviously at greatest risk for pick up and transmission of pathogens through this pathway. The VAPHS recommends the elective use of masks when a healthcare worker has a runny nose or is otherwise inclined to have frequent contact between the hand and nose. Masking is elective but, not required as a part of Contact Precautions at this time at the VAPHS.

Note: Under both Contact and Standard precautions, personal protective equipment (eye protection, masks or face shields) is required if any risk of splashing of body fluids is anticipated.

IV. Supply systems to support contact precaution requirements

Reliability of supply at the point of need has been a key enabler of improved precaution compliance. The clear goal is that nurses, doctors and other healthcare workers should never have to interrupt their patient care routine to hunt for precaution supplies. If supplies temporarily stock out at some point in the system, it should be immediately clear what should be done next and who has accountability for the system that may have stocked out.

The glove supply system is a case study in the application of these principles. Until January of 2002, it was not uncommon to enter a room on 4-West and find one or more of the wall-mounted glove boxes empty. There might have been multiple open boxes of gloves scattered throughout the room on countertops, inside cabinets or on sills. The problem was that the simple task of gloving involved a distracting hunt for gloves at best, and at worst a frustrating search for floor staff to obtain gloves from the central stock room. Accountability for restocking the gloves belonged to “everybody”, but no one owned the process.

The solution to stabilizing the glove supply system consisted of fixing several systems problems. First *store* and *safety stock* quantities were estimated from observations of healthcare worker-patient encounters. It was determined that stocking could reasonably take place once per day and that one box of each size of glove (medium and large) should be sufficient to cover routine glove needs and additional needs if the supply system broke down. These store and safety stock glove boxes of both medium and large gloves were set up in the cabinets of every patient room.

The wall mounted dispensers were clearly labeled that, if empty, gloves could be found in a designated cabinet. The cabinet doors were also labeled to lead healthcare workers and stockers to the stores. All labels were color-coded to correspond to the service (in this case escort) that was accountable for maintaining that part of the system. After several weeks of trials the system was determined that the initial assignment of replenishment could not be reliably fulfilled by the environmental services and the restocking was assigned to the current escort service. The escort now reliably restocks gloves every 24 hours to every room and gloves are always available.

V. Equipment cleanliness

Equipment that contacts patients or their environment has the potential to become a vector for transmission. RN's and other healthcare workers tend to be aware of this risk, but are often frustrated by the lack of convenient cleaning supplies to disinfect equipment between patient use.

A. Dedicated equipment in rooms:

One solution identified by the RN's was to reduce the sharing of equipment between carriers and non-carriers.

1. **Bright Red Stethoscopes** are placed in isolation rooms for use by the staff on the resident patient. These stethoscopes are of relatively high quality so there is no need for a healthcare professional to use a personal stethoscope. After a patient is discharged, the red stethoscopes are bagged and sent to sterile processing for cleaning, then return by the central supply group. The distinct red color is intended to help the staff remember not to remove the stethoscope from the room.
2. **Ivac thermometers** are also dedicated in each of the isolation rooms to prevent circulation. We have removed the rectal probes from these thermometers to prevent rectal use in infected patients. RN's have also candy-striped a roll-around Dynamap vitals machine to identify its dedicated use on isolated patients..
3. **Disposable blood pressure cuffs** which cost about \$2.50 are available in all of the isolation rooms. This eliminates the need to soak the woven fabric of blood pressure cuffs to remove dirt.

- B. **Disinfecting wipes & holders** are available throughout the unit and on temporary isolation carts. Nurses and other healthcare workers report that the convenience of a readily available, disposable wipe is critical to supporting the constant disinfect of equipment before it is stored for reuse. We had trouble preventing mold grow on the inside of the lids of the first product we deployed, Kimberly Clark's Wet Task. We have since switched to PDI Wipes that come in a disposable container that is discarded after the

wipes are consumed. Importantly, both Kimberly Clark and PDI supply free wall mounting holders for their wipe containers. We found it was critical to mount the wipes, so that everyone knew the reliable locations to obtain a wipe.

- C. **Clean & Dirty Equipment Rooms that actually work.** A 5S exercise was conducted on the Clean and Dirty utility rooms on the unit to improve the efficiency of accessing equipment. Nurses decided that the standard of equipment handling would be to place equipment in the Clean equipment room only after it had been cleaned. The Clean equipment room is lined with simple signs on the walls displaying a picture of the equipment that is to be stowed below it. The status of this equipment (e.g. “plugged in to recharge batteries”, oriented for easy pickup, etc) is also indicated on the equipment signs. The principle here is that whenever RN’s need equipment from the room, they can rest assured that it is clean and ready for use.

VI. Staff education

Education of staff on infection control practices continues to be conducted as a part of employee orientation sessions by the local Infection Control Professional (ICP). Observational studies and conversations with healthcare workers revealed a gap in understanding the severity of the antibiotic resistant organism problem and in following prescribed precautions.

For healthcare workers in the 4-West Inpatient Surgery Unit and the 3-West SICU we teach a separate module on resistant organisms (R/O) that explains the following:

A. Nosocomial Infection and MRSA awareness

Most healthcare workers in this training are surprised at the magnitude of the problem of hospital-acquired infections. We review the size of the nosocomial infection problem in the United States, its costs and the implications for patient outcomes. We also discuss the rise of MRSA as a leading pathogen in the US.

B. Principles of MRSA transmission

The most common misconception we encounter is that MRSA is a result of the overuse of antibiotics on individual patients. In fact, the hands and clothes of healthcare workers are the more likely primary vectors in R/O transmission. Another misconception is that just isolating patients with MRSA infections will prevent the spread of MRSA. Patients who are colonized with MRSA actually outnumber infected patients more than 5 to 1 and present a significant risk of further MRSA transmission. Finally, there is often an attitude that “Well this patient has a lot of medical problems and containing him/her as a MRSA reservoir is not a priority.” Our bottom line has been that we have to identify and contain all MRSA carriers if we hope to shutdown transmission.

C. Hand hygiene

Most healthcare workers are aware of the importance of hand hygiene, yet few take a systematic approach to cleaning their hands. Hand washing has been the dominant mode of hand hygiene. Our training module presents data from studies that confirm, for unsoiled hands, alcohol hand rub is more effective than antimicrobial soap, which is in turn more effective than regular soap at disinfecting hands. Specifically, alcohol hand rub kills more germs and its effect lasts longer than antimicrobial or regular soap.

Our initial observational studies showed our staff to be on par with national averages for hand hygiene (typically 10-30%). We have found that healthcare workers who have a strong habit of using alcohol hand rub when appropriate are much more likely to perform hand hygiene at all with patient encounters than healthcare workers who prefer just hand washing. We have aggressively pitched a preference for using alcohol hand rub for hand hygiene whenever appropriate in order to cultivate higher hand hygiene rates.

The official CDC recommendation is for hand hygiene after patient contact. Our observational studies suggested that leaving hand hygiene to the discretion of the healthcare worker as to whether they had patient contact, or 'much' patient contact did not cultivate a habit of hand hygiene. We thus adopted a more stringent expectation of hand hygiene on entry and exit to a patient room and between procedures on the same patient. Since alcohol hand rub has been made readily available at the doors of every patient room and takes seconds, we believe this tighter standard is a practical way to cultivate good hand hygiene habits.

When hands are soiled or a patient demonstrates *Clostridium difficile* associated diarrhea, we require hand washing with anti-microbial soap and water. We have been aggressive at removing barriers that reduce the likelihood of appropriate hand washing. We have installed sinks to improve convenience at our long-term care facility. We replaced shallow sinks and troublesome faucets with better functioning equipment in our ICU's. Finally, we have carefully inspected and adjusted the water pressure in inpatient rooms to eliminate splashing that can inhibit hand washing.

The bottom line is that we believe hand hygiene is the single most effective way to reduce contact transmission. We believe expectations for 100% appropriate hand hygiene must be clear from leadership and reinforced by peer-to-peer immediate staff feedback. All barriers to performing hand hygiene and all excuses for not doing hand hygiene need to be removed.

D. Precaution practices

Our discussions with staff revealed that ‘Precautions’ are generally thought of as applying to patients known to be carriers of resistant organisms. We review the fact that all patients are under at least *Standard* Precautions, requiring hand hygiene for all encounters, and gloving and gowning for fluid exposure risks. We also review the components of Contact Precautions for identified MRSA carriers.

E. Surveillance culture importance

The fact that 60-80% of the MRSA reservoir is typically not identified without surveillance culturing motivates our program to swab all patients on admission and on discharge. We emphasize that not knowing how big the ‘rest of the iceberg’ is in the unidentified MRSA reservoir contributes to a false sense of safety and fails to protect all patients from transmission.

F. Use of contact precaution list

We also introduce the class to the Contact Precautions List that prints on every unit so they can reliably know who should be in contact precautions. This list is generated from positive laboratory MRSA culture results (both nares and clinical). Any inpatient with a positive culture within the prior two years appears on this list. Patients can be removed from the list if they have two negative nares cultures, spaced at least two weeks apart, while not receiving antibiotic therapy. The underlying principle here is that every one must have a readily available checklist on their unit to confirm the contact precaution need of every patient.

G. Case for cultural change

Finally, we discuss the need for healthcare workers to become advocates for giving immediate feedback to their peers when they see a violation. We suggest that the current culture, where healthcare workers frequently observe other healthcare workers violating precautions and say nothing, actually reinforces the wrong behavior. When silence is the norm, advocating patient safety is perceived as abnormal and confrontational. We want to turn this culture upside down, it should seem unacceptable to see a precaution violation and not give immediate feedback. Healthcare workers should get used to constant feedback and compliance needs to be perceived as very abnormal.

The practical issue is how to efficiently train staff to lead this cultural change. We start by talking about the problem openly. We also suggest memorizing a couple of diplomatic sentences to give feedback to the offender. In this way, there is no fumbling for words in a difficult situation. These rote comments should also be accompanied by a universal gesture we are promoted to remind others to do hand hygiene.

This gesture consists of holding the hands up at shoulder level with the palms in. Finally, we discuss the do's and don'ts of what to say to other nurses and doctors who are seen failing to comply with precautions.

VII. Feedback Measuring implementation performance and Connecting behavior with patient outcomes

A. Implementation metrics

Compliance with placement of patients in contact precautions is supposed to be checked against the unit MRSA carrier list every morning on each unit by the charge nurse or a designated nurse. This check is to be recorded daily in acute care and twice weekly in long-term care, then submitted monthly to a data coordinator who compiles the information to track compliance. The inspection consists of checking if all carriers are placed in appropriate rooms, have correct signage posted, and have isolation supplies available. Typical isolation compliance rates run about 98%.

B. Admission swabbing

The nares swabbing of every patient is indicated as one task on the task list for unit admission. The charge nurse reviews the unit admissions checklist by the end of the shift to ensure that all admissions tasks have been completed for each admission. A tally is kept as to how many admitted patients are swabbed within 24 hours of admission and charted. Typical admission swabbing rates run over 95%.

C. Discharge swabbing

All patients are swabbed on discharge to determine if a nosocomial transmission has occurred. This swabbing is incorporated as part of the discharge procedure and compliance is also charted. Typical discharge swabbing rates run over 90%.

D. Soap & sanitizer monitoring

We also weigh soap dispenser bags and alcohol hand rub canisters every 7-14 days to determine consumption on the inpatient surgery and surgical intensive care units. We then divide this total consumption by the unit dosage per hand hygiene event and the total bed days of care. This estimates the maximum possible hand hygiene events per bed day of care that could have occurred in the time period. While not precise, this metric gives a good upper bound on the hand hygiene rate: early change out of canisters or material spoilage would only decrease the hand hygiene rate. We plot the soap and alcohol handrub events per bed day of care over time by unit.

VIII. Countermeasure effectiveness

The ultimate test of all of these countermeasures is whether patients are becoming colonized or infected. We combine the nosocomial colonization and infection rates to get an overall nosocomial transmission rate. Intuition would suggest that the higher the MRSA reservoir, that is the higher the percentage of incoming patients are MRSA carriers, the higher the expected transmission rate. However, our hypothesis is that if contact precautions are complied with, the size of the MRSA reservoir will not impact the transmission rate.

A. Nosocomial colonization rate per 1000 BDOC (Bed Days of Care)

We track the colonization rate per 1000 BDOC by dividing the number of patients with positive discharge and negative admissions swabs by the bed days of care.

B. Nosocomial infection rate per 1000 BDOC

We track the nosocomial infection rate per 1000 BDOC by dividing the number of patients positive for MRSA infection and negative on admission by the bed days of care.

C. Nosocomial transmissions per 1000 MRSA BDOC

The total MRSA transmission rate is simply the sum of the nosocomial colonizations and infections divided by the total bed days of care for the period.

D. Nosocomial transmission index

We also calculate a nosocomial transmission index that divides the nosocomial transmission rate by the MRSA pressure (MRSA BDOC divided by the Total BDOC). This gives us a scaled transmission rate of nosocomial transmissions per MRSA BDOC. This gives us a strong measure of the effectiveness of our contact precautions at stopping MRSA transmission.

IX. Real Time Problem Solving

A key driver of success in implementing these countermeasures is to follow up immediately on implementation problems as they are identified.

A. Follow up on all transmissions

When any transmission, whether colonization or infection occurs, a quick review of the case is performed to look for contributing factors. This has produced many practice changes. While no cause and effect can ever be directly attributed to the transmission, each case often points to some

likely weakness in our barriers to transmission. These case learnings are strongest when they engage the staff in asking “5-Why’s” as to what could have happened and are followed by prompt communication of learnings to the wider staff. This prompt communication impacts the staff in a number of ways: first, awareness is raised that more transmissions are occurring than originally thought; secondly, that their actions matter in reducing transmissions; and third, that they may have insight into identifying further weaknesses in our defenses against transmission.

B. Setting up a hypothesis for testing

A further learning from real-time problem solving is that every countermeasure we come up with must be regarded as a hypothesis to be tested. When countermeasures are implemented as being ‘tentative’, we are more likely to question their effectiveness and practicality. Through this real-time testing, we have often found that initial ‘solutions’ had weaknesses that required revision.

X. Managing patient transfers

For receiving units, a patient’s MRSA status is readily available on the formal electronic *Transfer Note* completed by the transferring unit and the cover sheet of the computerized patient record. As mentioned, the daily list of MRSA carriers is also printed out on each unit every morning. Finally, a Communications Center that coordinates transfers tracks the MRSA status and makes note in its transfer instructions. This wide availability of information on who is a carrier ensures that no unit is unaware of the MRSA status of the internal patients it receives.

XI. Visual environment

Part of making the cultural change to aggressively shut down all pathways for MRSA transmission requires embedding into the visual environment the best way to work. This helps to remove ambiguity in task execution and improves collaboration and efficiency.

A. Gown lines on floor

Gown lines on the floors of dedicated isolation rooms help to make clear the appropriate garb for different interactions with patients. One of the problems we encountered when trying to enforce universal gowning in contact precautions was resistance from doctors and nurses. These healthcare workers pointed out that many of their encounters with patients require them to enter the room, talk with the patient, and perhaps review the input/outputs sheets, but otherwise not contact the patient or the environment. We settled on a compromise to accommodate these low risk encounters. We marked off a perimeter an arms-length from the patient

bed, furniture and other equipment, outside of which healthcare workers could safely interact with the patient without needing to gown. This perimeter was marked with a red, floor-marking tape and signs posted at each end stating the need to gown. The input/output clipboards were also removed from the end of the bed to a wall-mounted box. In this way, it is unambiguous as to where a healthcare worker needs to be gowned or can remain ungowned.

B. “Right to Clean Hands” sign in every room

Across from every inpatient bed on the inpatient surgery unit, we have placed an attractive framed poster stating, “Patients, You have a Right to Clean Hands. Please remind everyone to sanitize or wash their hands when entering or exiting the room.” This poster is prominent in the field of view of the patients and has prompted some patients to speak up about hand hygiene lapses. More importantly this poster reminds healthcare workers of the expected standard of hand hygiene and the commitment to patient safety.

C. Visual management boards for directing patient placement.

We deploy a system of visual management boards to better coordinate the flow of updated information on patients, appointments, attending RN’s and MD’s and room status. One large board is in public view at the nurses’ station listing patient names in color, room numbers and the assigned RN. Beds that are available occupied or in some state of cleaning are also listed. As admissions, discharges and cleanings occur, different healthcare workers continuously update the boards to facilitate communication. The entire board is highly adaptable as the information is posted with white board markers or magnetic sign strips.

Compliance with patient privacy was achieved by keeping a written record of oral requests by admitting RN’s of the patients’ permissions to post their names. A second, smaller private board is hung inside the nurses’ station where it is not visible to the public. Here doctors’ names, order of contact, pagers, etc is posted to expedite contact. The patient names and services for the doctors are color-coded to facilitate quick reference.