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Short Communication

Communication between Clinical and the Hospital- Based Microbiology Laboratory: Strategies for 2015 and Beyond

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Abstract

Treating infectious diseases cases in the hospital poses some unique issues in comparison with treating other equally sick inpatients. The diversity of potential pathogens for a given infected site (e.g., pneumonia) and the changing spectrum of antimicrobial susceptibilities are variables generally not encountered with other diseases (the two preceding sentences had been deleted on the copy submitted by the reviewer(s). Infectious diseases may also have distinctly geographical and/or travel aspects as shown by the Ebola virus disease in West Africa or inhaled fungal infections such as coccidioidesmycosis from the southwestern United States. Communicable diseases due to specific infectious agents (influenza virus, methicillin-resistant Staphylococcus aureus (MRSA), extended spectrum beta-lactamase-producing gram-negative rod bacteria (ESBL-GNR's), and Ebola) also pose challenges in timely diagnosis, infection control, and patient-family-colleague education. In the case of Ebola virus, the presence of only a few infected individuals in the United States in 2014 caused nationwide concern among healthcare workers and the public. Clinicians, infection control staff and the hospital-based microbiology laboratory all received many queries about route of transmission, diagnostic testing, and personal protective strategies.

Antimicrobial therapies, while often remarkably effective, also carry the potential for specific adverse events, some infectious. These include *Clostridium difficile* enterocolitis or fungal overgrowth when broad spectrum agents are used. The high cost of some agents and serious potential organ toxicities are additional limiting factors, especially in the absence of a firm diagnosis. Finally, inappropriate use of antimicrobial agents including unnecessary use, selection of an overly broad spectrum of activity, too long a course, and too high or too low a dose can drive increasing microbial resistance to these drugs [1].

Having practiced infectious diseases in the hospital setting for over 30 years, I have seen the changing role of the clinical microbiology laboratory in patient management. More recently, as director of an antimicrobial stewardship program [2] in a 300-bed community teaching hospital, I have also seen firsthand some of the pressures and resource limitations affecting our laboratory. Everyone, it seems, is being asked to do more with less, and to have it done by "yesterday." Fortunately, my health system's clinical microbiology laboratory has very experienced leadership and many technicians have had over a decade of experience in the field. This makes my life much easier as well as helping the hospital and entire health system run more smoothly. However, the need to function quickly and efficiently will continue to be a priority and warrant careful thought and planning in many areas [3].

Timeliness of testing and reporting

Hospitals are now becoming 24/7 operations as there is steady pressure to reduce length of stay. I have seen patients discharged late at night, though this is often at patient/family insistence rather than as a clinical plan. However, every decision to discharge represents a balance between having enough clinical information for diagnosis and effective therapy (e.g.an antibiotic) versus how sick a patient is and the prognosis for improvement. Much of this pressure is financial and to be honest, clinicians have in many cases been able to both shorten hospitalization and maintain quality of care. For example, higher dose shorter duration oral fluoroquinolone regimens and overall shorter durations of inpatient pneumonia therapy have safely reduced the percentage of pneumonia patients requiring admission and facilitated earlier discharge of others. Unfortunately, this

trend has led to microbiology laboratory test results sometimes becoming the rate limiting step in the discharge process. For example, infectious diseases consultants are sometimes asked to recommend oral therapy for discharge before urinary tract infection pathogens have been identified or susceptibilities determined. While patients who have defervesced and whose signs and symptoms of infection are resolving would seem to be good candidates for discharge on oral antimicrobials, there are enough cases of bacteria resistant to the oral agent of choice to make this risky clinically and medicolegally.

The best approach from the microbiology bench would therefore be to emphasize rapidity of turnaround time on gram stains, cultures, and serologies WITHIN REASON. Rapid diagnostic testing is one answer, as in the case of influenza A/B and respiratory syncytial virus antigen testing. Streamlining specimen handling may be another. My five hospital system utilizes a central microbiology lab so that specimen transit time has to be considered for most of the hospitals. Local specialized "stat lab" testing is one answer, depending on cost and efficiency studies. On the other hand, investing in very expensive equipment to speed identification of an organism or generate susceptibilities a few hours earlier may not be the best investment. Review of the flow of clinical specimens from collection to transport to processing to reporting of results indicated getting final results at 3 am rather than 6 am probably did not improve efficiency very much. Whatever the methods for getting results quickly, the clinical benefit is considerably enhanced by communicating them effectively.

Communicate effectively

Great patient care relies on communication from the patient and family to the diagnosing clinicians to the treating staff and back again. Much information is now being communicated online, e.g., the electronic health record (EHR) and local viewing of radiolologic data on personal computers. Availability of data almost as quickly as it is generated is certainly a great improvement over the old paper report slips or daily printouts of results [4] However, someone must look up the data in the EHR and for certain information such as positive blood cultures or sputum acid-fast bacilli smears, rapid and accurate reporting to someone in position to act on the results is critical. Thus, having experienced laboratory staff that understand this and get the information to the appropriate health care provider(s) can have a positive effect.

Even routine reports can provide guidance that improves timeliness of patient care. A gram stain report on sputum can provide much information to distinguish oral contamination from true infection. Also, describing growth in "chains" versus "clusters" for gram-positive cocci, especially in blood or other usually sterile fluids, can get appropriate clinical management going earlier. It goes without saying that this data has to be generated by technicians confident in their readings and that changes should be flagged, timed and dated. There have been occasional inexperienced laboratory staff that have changed readings as from gram-positive to gram-negative or from culture-positive to negative without leaving documentation of the change. This can be very harmful to patient care and clinician confidence in the laboratory. This leads to a related topic.

Emphasize education

Everyone in health care is (or should be) an educator. In the case of the clinical microbiology laboratory, there is a very important role in educating other hospital staff about microbiology findings [5]. In some cases, this is one-on-one over the telephone. When communicating culture results or fielding a request for specialized testing, the challenge is to communicate the answer clearly and gauge how well it is understood. Read back of critical results is one way to insure that the information was correctly communicated and avoid errors. While laboratory staff in academic teaching hospitals are probably used to hearing from medical students not quite sure what they are asking about, this is not an infrequent occurrence at any hospital. The classic mistake seen by infectious diseases physicians is to be called about "the best treatment" for an enterococcal infection. A little research, which fortunately no longer necessitates a trip to the patient's chart or a call to the microbiology lab, reveals that the organism is an Enterobacter species. The proliferation of health care extenders (physicians' assistants, nurse practitioners, etc.) mean that staff in the microbiology lab should be comfortable discussing the significance of a culture with poly microbial growth, multidrug-resistant pathogens (such as ESBL-GNR's), and coagulase-negative staphylococci versus Staphylococcus aureus, with individuals of differing levels of clinical expertise and experience. Knowing when to refer questions, as to a laboratory supervisor or specialist service, is also key. This is often the case in which as caller is asking about the significance of microbiology results vis-à-vis isolation for specific communicable diseases, management of patients with unusual pathogens in culture, or serologic testing for exotic diseases (e.g., dengue, Chickungunya, or Ebola). The further these questions fall outside of the microbiology lab routine, the more an accurate referral (ideally with contact information) will save time and angst for all concerned.

Think multidisciplinary; embrace technology

Just as hospitals are being forced to run continuously, the "silo mentality" in which different hospital groups keep to themselves is being set aside. Anyone treating patient with infections in the hospital now has to interact with the primary clinicians (both outpatient and hospitalist), specialist consultants, infection control practitioner, pharmacy, formulary committee, nursing leadership, education committee, quality assurance committee, and information technology service at a minimum. Thinking this through ahead of time can avoid confusion and more work later on. Thus, information on antibiotic susceptibilities, especially current trends, could be of interest to not just clinicians, but also infection control programs, the pharmacy, and quality assurance programs.

Computer software may offer some solutions, such as in flagging specific communicable diseases for attention, suppressing antimicrobial susceptibility results with the guidance of the formulary committee, and collecting pathogen frequency and resistance trends. This may allow valuable epidemiologic studies to guide future decision-making. Point of service education is also becoming feasible, guiding practitioners on antimicrobial costs, reasons for restrictions on specific

agents, and reporting requirements as they enter orders via the computer. Publishing antibiograms regularly is also useful, though as much for infection control and formulary committee purposes, as for guiding individual practitioners in antimicrobial selection. While this can be a time-consuming task, software can be a major help in the endeavor.

While it has been argued that only death and taxes are certain, I suspect that increasingly rapid changes in the way everyone manages data will be a common theme now and in the future. Clinical microbiology information is key to treating many patients in and out of the hospital, and getting the data to the right groups in a timely fashion in as useful a form as possible will become more and more critical.

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