Best care Always! newsletter

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Chairperson's Report

It is hard to believe it's been a year since we launched the Best Care Always! (BCA) Campaign at the FIDSSA and CCSSA Conference at Sun City. A year after the launch, we have over 190 hospitals signed up to implement at least one bundle. This includes 15 provincial hospitals and 24 independent private hospitals, in addition to the Life Healthcare, Medi-Clinic and Netcare hospitals that are all signed up.

In total, over 600 interventions are in place which cover more than 3000 ICU beds and almost 1000 operating theatres. Whilst these are impressive numbers, it is not the enrollment statistics that have been the highlight of the campaign but rather the reports of improvement at the patient's bedside.

During a recent hospital ICU visit, I asked a unit manager what keeps him committed to the BCA campaign and he replied: "The tangible results for our patients and the teamwork that has developed with the doctors and other health professionals working in the unit". This unit manager and his team were particularly pleased with the fact that they'd reported zero Central Line-Associated Blood Stream Infections (CLABSI) for two consecutive months in their unit and the same hospital has not experienced any Catheter-Associated UTI (CAUTI) infections for four months.

Importantly, as was anticipated, the infection prevention bundles have become a starting point for further improvement initiatives. A number of hospitals attribute this to an enhanced understanding of key processes, rigorous measurement of compliance to the individual elements and standards, as well as monitoring the outcomes.

Measurement is indeed a critical part of the campaign and we are especially pleased with the measurement workshop for the Gauteng Province BCA learning collaborative which was held in June. The amazing teams of nurse leaders, unit managers, infection prevention coordinators and QA staff who attended have made great strides forward in implementing the campaign in their hospitals and we look forward to hearing how they have done with regard to the application of measurement systems at the next session in August.

The Gauteng Learning Collaborative is being developed as a prototype for the extension of the campaign to other provinces and is based on the Plan-Do-Study-Act methodology which facilitates an active learning approach to the work. We are thrilled to be holding the first workshop with hospital CEOs in Gauteng in August.

While measurement brings credibility and information required to make further decisions, collaboration has been the true accelerator of the campaign. We set out as a founding principle, or more accurately, a founding question: "Can shared learning and working together on specific areas of clinical practice accelerate the pace and scale of improvement at the frontline of healthcare?" While it is certainly too early to know the overall impact of the campaign, the interest in participating has been remarkable and it seems the more we actually work together, the more ideas and the more we achieve with limited resources. We are so pleased to have signed up further collaborative societies and organisations including the Forum for Professional Nurse Leadership (FPNL), the South African Theatre Nurses Association (SATS) and the Surgical Society of SA (ASSA).

The National Department of Health has included BCA as a stakeholder and member of the Quality Improvement (QI) initiative for the six QI priority areas and we have made substantive progress with a number of other provincial health departments. We are also excited to have worked closely with the Institute of Health Improvement (IHI) in the last provincial workshop and are in discussions with them on partnering further in this work.

There's a lot still to do, so much to learn and so much more we can achieve with all our partners. The next few months will include looking into what other areas of improvement we can consider as additional campaigns and how we can further expand our collaboration in the sector. For example, hospitals have asked BCA to offer a broader variety of improvement campaigns that extend beyond ICU.

In summary, I would once again like to acknowledge the contributions made by each member of the BCA Task Team and all our collaborative partners. We are so encouraged by the level of support and enthusiasm of South African health professionals that have taken on the front-line leadership of improvement.

We are indeed a nation alive with possibility and if the past year for BCA is anything to go by, the possibilities are extraordinary.

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Gauteng Public sector hospital CEOs, senior managers and National Department of Health representatives attended a Best Care Always/IHI workshop in Johannesburg in August

Antimicrobial Stewardship

Antimicrobial resistance due to inappropriate utilisation, both therapeutically and prophylactically, is reaching dire proportions. This summary contains information on the concerns stemming from hospital statistics, appropriate dosing and a summary of antimicrobial surgical prophylaxis.

A. Stewardship

The following comprises a list of what can be regarded as appropriate antimicrobials for utilisation in an ICU or High Care setting:

- Gram negative cover: piperacillin /tazobactam, cefipime / cefpirome, ertapenem / imipenem / meropenem, gentamicin / amikacin / tobramycin and tigecycline
- Gram positive cover: linezolid, vancomycin / teicoplanin, tigecycline
- Anti-fungal cover: fluconazole / voriconazole / posaconazole, caspofungin

Utilisation can be monitored based on:

1. **The number of patients per month treated for more than 7 days with any of the above.** With the exception of certain conditions e.g. septic arthritis, osteitis, endocarditis, prosthetic joint infection etc., it is generally accepted that non-response to therapy in an immune-competent patient after 7 days duration would imply that source control is inadequate, the drug selected is inappropriate or the organism is resistant to therapy.
2. **Patients treated with combination therapy with 2 antimicrobials from the same group.** With exceptions like empiric treatment of suspected pseudomonal infection in seriously ill patients, febrile neutropenia and bacteremic pneumococcal disease etc., there is no advantage to combining drugs that provide similar cover. Drug reactions are more frequent and costs increase.
3. **The number of patients per month on more than 3 parenteral antimicrobials at the same time.** With the exception of a seriously ill patient where Gram negative and Gram positive therapy as well as anti-fungal therapy might be relevant, few indications exist where this combination is necessary. Broad based cover should be de-escalated based on an antibiogram after appropriate microbial culture, yet de-escalation is instituted in only 10% of cases.
4. **There are specific antimicrobials which are appropriate for surgical prophylaxis.** It is important to note that vancomycin and teicoplanin have limited indications. One of the indications is for repeat prosthetic device surgery, where there was a failure due to a methicillin resistant staphylococcus infection. Also important to note that vancomycin is becoming less effective due to increasing minimum inhibitory concentrations of this agent for staphylococci.
5. **Optimal dosing strategy.** In a seriously ill patient, an optimal dosing strategy reduces both mortality and length of hospital stay, and reduces the selection of antimicrobial resistance, which is of particular importance when treating pseudomonal infection.

Time dependant antimicrobials eg. beta-lactams should be given via a loading dose followed by continuous infusion over 24 hours with the exception of the current carbapenems, which should be given via an extended infusion over 3–4 hours per dose, due to instability over time.

Table 1

	Loading dose	Dose over 24 hours	Dose over 3-4 hours
Piperacillin / tazobactam	4.5 gram	13.5 – 18 grams	
Cefipime	2 gram	4 – 6 grams	
Imipenem			500 mg 4x/d or 1 gram 3x/d
Meropenem			1 – 2 grams 3x/d

Concentration dependant drugs eg. aminoglycosides should preferably be given at an increased dosage once a day.

Table 2

	Dose once per day
Gentamicin	5.1 mg/kg/d
Amikacin	15 mg/kg/d
Tobramycin	5.1 mg/kg/d

Under-dosing combined with extended duration of therapy is specifically seen as a driver of antimicrobial resistance.

Current resources should be optimally utilised in an effort to prolong efficacy as there are no new Gram negative antimicrobial classes coming to the market soon.

B. Surgical antimicrobial prophylaxis

Timing of antibiotic administration

Antibiotic must be given so that good tissue levels are present for the duration of the procedure and for the first 3-4 hours after surgical incision.

Recent reviews suggest administering parenteral antibiotics ideally 30-60 minutes before the surgical incision is made (with the induction of anesthesia) and certainly within 2 hours of surgical incision.

Duration of prophylaxis

There is little evidence to support prophylactic administration of antibiotics past the period of operation and recovery of normal physiology following anesthesia.

For most surgical procedures, a single dose of antibiotic given just before the procedure provides adequate tissue levels. Most experts agree that prophylaxis should be discontinued within 24 hours of the operative procedure.

If a procedure lasts for several hours (longer than 3 hours), repeat doses of the antibiotic may be necessary intra-operatively to maintain adequate levels.

When a prosthetic device is inserted, prophylaxis is often given for at least 24 hours. Most authors prefer a three-dose regimen, depending on the drug being used.

Organisms involved

Most surgical infections are acquired from the patient's own microbial flora. The remainder is acquired from the staff in the operating room during surgery or staff in the ward.

S aureus is the major pathogen in wound infections after clean surgery.

Gram negative bacteria cause wound infection especially when surgery of the colon, gynecological organs or genitourinary tract is undertaken.

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Antimicrobial Stewardship *cont.*

Which agent?

First generation cephalosporins are widely favoured due to adequate spectrum of activity, few side effects, a low incidence of allergic reactions and cost. First generation agents are more active against S aureus, are less expensive than newer agents and have a narrow spectrum of activity (therefore less likely to select resistant organisms) and are the preferred agents for most surgical prophylaxis.

Cefazolin has a moderately long serum half-life, which is ideal for prophylaxis (1.8 hours). Data suggest that this agent should be used at a dosage of 2 gram for an adult patient due to the pharmacokinetics of cefazolin.

For colorectal surgery, cefuroxime plus metronidazole or cefoxitin is preferred because of activity against Gram negatives and bowel anaerobes.

Third generation agents should preferably not be used for prophylaxis due to their limited staphylococcal cover and their selection of extended spectrum Gram negative resistance.

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MEDI-CLINIC
Private hospital group

Practical measurement of infections per 1000 device days

The Best Care Always (BCA) campaign provided the necessary impetus to begin measuring our infection rates per 1000 device days.

We wanted to establish reliable baseline infection rates (per 1,000 device days) before we began active implementation of the care bundles for the prevention of central line-associated bloodstream infections (CLABSI); ventilator-associated pneumonia (VAP) and catheter-associated urinary tract infections (CAUTI). Measurement is a key component of any continuous quality improvement initiative.

In order to measure these infection rates per 1000 device days, we needed to start measuring the cumulative central line days, ventilator days, and transurethral catheter days. Many of our critical care units were already measuring device days, and we obtained their input in order to develop and standardise a measurement tool that could be utilised with relative ease.

The figure below provides a snapshot of a compressed monthly Excel spreadsheet that is now utilised in our hospitals to calculate the sum of device days and infection rates:

1	HOSPITAL:	(PLEASE SELECT HOSPITAL)		
2	UNIT NAME:	(PLEASE FILL IN)		
3				
4	MONTH	(PLEASE SELECT MONTH)		
5	YEAR:	(PLEASE SELECT YEAR)		
6				
7	MONTH OF DAY	NO. OF PT'S VENTILATED	NO. OF PT'S WITH CENTRAL LINES	NO. OF PT'S WITH URINE CATHETERS
38	31	3	4	7
39	TOTAL	134	147	177
40				
41	NUMERATORS			
42	TOTAL NO. OF PT'S WITH VENTILATOR ASSOCIATED PNEUMONIA (VAP):			2
43	TOTAL NO. OF PT'S WITH CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTIONS:			1
44	TOTAL NO. OF PT'S WITH CATHETER ASSOCIATED URINARY TRACT INFECTIONS (UTI'S)			3
45				
46	RATES			
47	VENTILATOR ASSOCIATED PNEUMONIA CASES PER 1,000 VENTILATOR DAYS:			14.9
48	CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTIONS PER 1,000 CENTRAL LINE DAYS:			6.8
49	CATHETER ASSOCIATED URINARY TRACT INFECTIONS PER 1,000 CATHETER DAYS:			16.9

Fig. 1: Monthly tool for keeping track of device days and calculating infection rates per 1,000 device days

Practical tips for measuring device days

1. Define the inclusion criteria: e.g. what is seen as a central line? We used the CDC definition for central lines and see the following as central lines: CVP lines, pulmonary artery catheters, dialysis catheters, implanted catheters (ports), umbilical catheters and intra-aortic balloon catheters.
2. Ensure that a designated person per shift counts the total number of devices at a specific time each day (according to the inclusion criteria). This method takes 5 mins - trying to do it retrospectively takes much more time and effort.
3. Work closely with the infection, prevention and control expert in your hospital to confirm infections - an infection is not just a positive culture.
4. Use your data to establish a monthly trend and as a motivation for your improvement initiatives.
5. Keep track of when specific interventions are implemented so that you can monitor the effect thereof.

Measuring our infection rates in this manner has allowed us to identify immediate areas of concern and each unit now knows what their baseline infection rates are before they begin *active and continuous* implementation of the bundles.

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Defining Outcome Measures for CLABSI, VAP and SSI in the Public Health Sector

Public sector involvement in Best care Always (BCA) is now underway in Gauteng. A 'learning network' of 12 public hospitals meets at roughly six week intervals to explore ways of reducing hospital-acquired infections (HAI) through the implementation of the BCA bundles.

Healthcare-associated infections are not routinely measured in the public healthcare system, so establishing outcome measures is essential to monitoring the impact of the project.

Recommended measures for CLABSI and VAP, based on 'incidence per 1000 intervention days', are difficult to implement even in resource-rich settings, because collecting denominator data ('ventilator-' or 'central line-days') poses a challenge and it is extremely unlikely that these measures will succeed in public hospitals where wards are understaffed, staff turnover is high and agency staff are used extensively.

Establishing viable outcome measures for the project therefore presents a challenge and a focus for improvement and development. There are no universally correct measures for outcomes, though selecting and defining measures within the constraint of any particular system is critical.

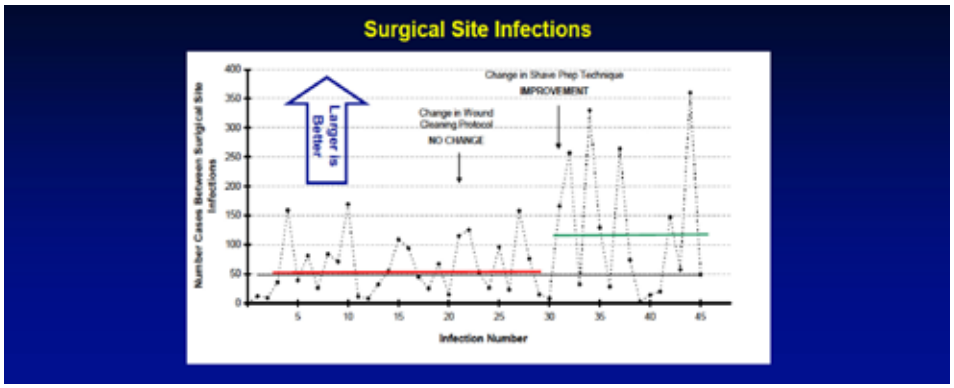
An alternative approach for measuring rare events by looking at the 'time-between-events', was explored with the group. This measure is useful when an event occurs between <1% and 10% of the time. The undesired 'events' (in this case HAIs) are measured along the X-axis in chronological order (e.g. first infection, second infection, third infection, etc.) while the 'time-between-events' is measured on the Y-axis (in this case in 'days between events'). The line graph plotted in this way goes up as the system improves and the 'time-between-adverse-events' increases. Figure 1 demonstrates these principles using the number of cases (rather than days) between events.

Lessons from a healthcare improvement project in Ghana with an outcome measure of 'days-between-maternal-mortality' were shared with the learning network. In the Ghana scenario, progress is recorded every day and not only when an adverse event occurs. This can be done either by recording the number of adverse events occurring each day (when no event occurs a ' zero' is recorded) or by updating a 'days-between-infections' chart every day – much like the display of 'accident free days' in industry (Figure 2). The chart is displayed prominently, serving as a constant reminder of the project, and encourages colleagues to work towards a common aim.

Using the 'days between' approach was embraced by a number of the Gauteng hospitals while others decided to test out different measures defined as monthly infection rates: in one instance the numerator was defined as the number of infections (CLABSI or VAP) per month and the denominator as the number of interventions per month (central lines inserted or patients intubated and ventilated, respectively), measured only once, at the time of the intervention. A group focusing on obstetric surgical site infections (SSI) defined the numerator as 'the number of re-admissions for septic Caesarean Sections' and the denominator as 'the number of Caesarean Sections done.'

All teams committed to testing their new measurement ideas and presenting their findings at the next meeting of the learning network. We anticipate that this process of designing, testing and sharing new ideas will result in the development of viable measures for tracking the impact of the BCA project on HAIs in public hospitals. Lessons learnt in the public sector may also be applicable to private hospitals where less demanding measurement systems may well improve the quality of the data.

Figure 1. Measuring Rare Events - Graph



Source: James Benneyan, Ph.D, Institute for Healthcare Improvement Northeastern University, Boston MA www.coe.neu.edu/research/qpl

This graph demonstrates an approach for measuring rare events. In this example, 'cases-between' surgical site infections (SSI) are monitored. The 'event' number is measured along the X-axis as SSIs occur (1st SSI, 2nd SSI, etc.), and the number of 'cases-between-SSIs' is measured on the Y-axis at the time the next SSI occurs. The central line (median), calculated before and after improvements to the system, shows that 'larger is better' since the number of days between adverse events increases as the system strengthens and SSIs occur less frequently (see text for examples for measuring 'days' rather than 'cases' between adverse events).

Figure 2. Measuring Rare Events

Source: http://www.magnatag.com/page/SAFETY/category/safety-boards.asp

The picture demonstrates one simple method of keeping a daily measure of time between adverse events. Keeping the count visible helps sustain interest in the project.

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Life Healthcare

Life The Glynnwood Hospital implements antibiotic stewardship programme

Life The Glynnwood Hospital was nominated by its holding company, Life Healthcare, to participate in the Best Care Always (BCA) antibiotic stewardship pilot project.

BCA initiated the antibiotic stewardship programme with a view to raising awareness about the responsible use of what is a critical health resource and to developing a bundle or series of interventions that will maintain the effectiveness of antibiotics for future use.

At the launch of the BCA antibiotic stewardship programme at Life The Glynnwood Hospital, a working group of doctors was elected. These doctors represent their colleagues and provide suggestions to resolve areas of concern identified from the antibiotic utilisation data provided by the hospital.

These doctors will also liaise with their colleagues regarding the suggested interventions where necessary. This working group meets on a monthly basis with pharmacists, ICU and High Care unit managers, and the infection prevention specialist to determine the appropriate steps to drive the antimicrobial stewardship programme within the hospital. The working group will also address the prophylactic use of antibiotics in theatre.

On a monthly basis, the hospital measures the following six aspects of antibiotic utilisation:

1. The number of ICU visits longer than two days without microbiology results recorded.
2. Four or more antimicrobials per patient.
3. Two or more agents with Gram positive spectrum of activity prescribed simultaneously.
4. Two or more agents with Gram negative spectrum of activity prescribed simultaneously.
5. Two or more antifungal agents per patient prescribed simultaneously.
6. Specific antimicrobial agents used in theatre.

Dr Adrian Brink has acted as a consultant for the programme. To ensure sustained awareness of the campaign, posters have been produced and placed on the notice boards of all theatres.

Pharmacists regularly monitor antibiotic usage in ICU and High Care and the feasibility of antibiotic rounds in these wards is being investigated. These rounds would include doctors, microbiologists, pharmacists, unit managers and the infection prevention specialist.

In addition, pharmacists' notes are being considered for the prescription charts in ICU and High Care. This would facilitate communication with doctors about an individual patient's antibiotic prescriptions for consideration upon their next patient care round. Doctors are contacted immediately for particular prescription concerns.

There has been an increased awareness of antibiotic use within the hospital since the start of the antibiotic stewardship programme. More doctors are phoning pharmacy regarding recommendations and dosing information. Changes in antibiotic prescribing habits have been observed and there has been a marked shift to obtaining microbiology results and tailoring treatment accordingly. Many of our doctors have shown a keen interest in supporting this initiative.

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From left: Sr Priscilla Attard (ICU Unit Manager), Yolande Greyling (ICU Pharmacist), Sr Vanessa Muller (HIC Unit Manager), and Gauri Miszka (HIC Pharmacist)

Healthcare Associated Infections: A Patient's Story

The Best Care Always! (BCA) campaign is about measurement, improvement and the application of scientific evidence. But mainly it's about, and for, people. It's about the individuals and teams who serve by providing medical care to the best of their ability, the people who are sometimes unintentionally harmed by that care, and the families who are affected when things go wrong.

This story was sent to us by a doctor whose father had emergency cardiac surgery one Sunday morning. The highly complex, life-saving, operation is a technical success, but 3 extremely difficult months follow for this patient and his family.

Read the story with your colleagues and discuss what went wrong. Could the outcome have been different? Could the complications have been prevented? Did systems within or outside the hospital fail this patient? Can such stories help us better understand our systems and improve care for our patients?

Mr B is a 77 year-old active man with a known history of coronary artery disease. He had 4-vessel coronary bypass surgery in 1999. Over the last six months, he noticed that his ability to exercise had diminished.

One morning in May, he was in the parking lot when he suddenly experienced a heaviness in his chest and was unable to walk. He managed to drive himself home and told his wife. She immediately called the cardiologist. Within 20 minutes, Mr B was in the ICU on oxygen and a heparin drip and the pain had diminished. On the coronary angiogram, he had several occlusions and the main graft from his prior surgery was severely narrowed. The lesions could not be stented and it was decided that he would require redo bypass surgery to save his left ventricle.

Mr B was kept in the ICU on strict bed-rest and one day prior to surgery an intra-aortic balloon pump was inserted. The team was assembled for Sunday morning and he underwent a 3.5 hour 2 vessel off-pump CABG. After surgery, he developed atrial fibrillation which was treated with amiodarone and he was extubated 36 hours post-op. He had delirium, possibly due to the administration of Ativan which was then stopped, and some fluid overload and signs of heart failure, which was successfully treated.

While Mr B's condition settled down somewhat, fluid from a chest drain was now cloudy. This was cultured and the family was told that he had pneumonia. The wound from the vein grafting was not changed during the course of his ICU stay.

Mr B was transferred out of the ICU to the ward. That day, there was a strike on the ward and the patient's wife was helping to hand out medications to other patients. Mr B was later transferred back to ICU for further care. A new course of IV antibiotics was prescribed to treat the chest infection.

On the day prior to discharge, Mr B experienced some bloody diarrhea and once home, developed explosive, uncontrollable diarrhea. A stool culture was positive for Clostridium difficile. He was readmitted back to hospital for uncontrollable diarrhea and treated with IV Flagyl for five days and then discharged home again. The diarrhea did not respond and his medication was then switched to oral vancomycin. This did not come in pill form and his wife had to dispense the IV liquid form in 4 divided doses daily. This was daunting for her and she felt very responsible if she made an error. After two weeks of constant diarrhea, the diarrhea slowly began to improve but a repeat stool culture still showed the presence of C difficile. Another course of vancomycin was prescribed.

At this point, the patient noted that he had a round, hard swelling in his thigh. He pointed this out to his cardiologist at his 3 month check up and was told it was a seroma. One week later, after he had been to physical therapy and was just starting to feel stronger, he developed chills and rigors. He saw his gastroenterologist who noted that the mass on his leg was red, hot and fluctuant and needed surgical drainage. The mass was aspirated by the surgeon the following day.

That weekend, his doctors were away and his daughter called the lab for the culture results, which were negative. However, the mass enlarged, the thigh was painful and his wife called the cardiologist again for advice. Mr B was again readmitted to a surgical ward where the surgeon saw him immediately and began IV antibiotics with vancomycin. His wife was now at her wits end. A repeat visit to the OR for open incision and drainage followed. The culture showed methicillin-resistant coagulase negative staphylococcus. He was treated with IV teicoplanin for 3 days and then discharged on oral vancomycin.

Over a weekend, the leg swelled up and fluid was oozing from the incision. This required a trip to the surgeon's office where a nurse had to probe the wound and express the draining fluid as the drain had blocked. The fluid was cultured and the wound now had to be dressed under sterile conditions, daily, by his wife.

Thus far, there seems to be no further infection and the diarrhea has finally settled. But this has been 12 weeks of constant strain on the patient and the family, most of which could have been avoided.

Milpark Hospital Takes Innovative Approach to Antibiotic Stewardship

In January, Netcare's Milpark Hospital employed a clinical pharmacist to conduct ward rounds in the hospital's intensive care units (ICU's) to monitor the use of antibiotics.

The appointment was made in support of Netcare's implementation of Best Care Always (BCA) and focus on antibiotic stewardship; one of the five interventions within the BCA campaign.

It is a well-known fact that areas in hospitals that utilise the most antimicrobials have the highest rates of antimicrobial resistance. Antimicrobial stewardship is broadly defined as a practice that ensures the optimal selection, dose and duration of antimicrobials and leads to the best clinical outcome for the treatment or prevention of infection while producing the fewest possible side effects and the lowest risk for subsequent resistance (George and Morris Critical Care 2010, 14:205).

Monitoring antimicrobial usage is currently being undertaken in the hospital's Trauma Intensive Care Unit, Burns Intensive Care Unit, Respiratory High Care and Acute Care Units. As part of the monitoring process, the clinical pharmacist is required to evaluate the prescription and make suggestions based on the dosage, duration, agent choice, agent combination and pathology results.
BCA's antibiotic stewardship initiative has been designed to facilitate collaboration with the hospital's infection prevention co-ordinator. Ultimately, this stewardship programme aims to limit the emergence and transmission of antimicrobial-resistant bacteria and more importantly, to promote the safe and rational use of antimicrobials.

As part of the monitoring process, an Antibiotic Treatment and Combination Analysis Report is compiled on a weekly basis. This report includes any concerns regarding antibiotic therapy and also contains input from the hospital's infection prevention co-ordinator. Final comments are posed based on interventions by the clinical pharmacist. If a therapy is inappropriate and unchanged after the clinical pharmacist's intervention, the matter is then addressed by the infection control doctor together with the prescribing doctor.

Weekly micro rounds are conducted during which the clinical pharmacist, infection prevention co-ordinator, microbiologist, unit manager and if possible, treating doctor, review the antimicrobial management of all patients in the Trauma and Burns ICUs.

Daily ICU ward rounds have impacted significantly on infection rates and resistance patterns in those units In the Trauma ICU, there has been a significant change in the resistance pattern of the pan/multi-drug resistant acinetobacter, showing a reduced occurrence from 31 cases in January - June 2009 compared to 9 cases in January - June 2010. This is in spite of a slight increase in use of carbapenems in the same period. The antibiotic interventions have also led to considerable cost savings for the patient.

The antibiotic stewardship campaign plays a crucial role in restricting the rate of antimicrobial resistance as there is a limited manufacturing pipeline of available new antimicrobial agents. Improper antimicrobial use leads to an increased morbidity rate, has a financial impact and extends the length of hospital stay associated with diseases.

The time has come for the prescription of antibiotics to follow evidence based practice; support the best clinical outcome for the patient; and save the resources that we have available.

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