NATIONAL HEALTH LABORATORY SERVICE

Global Antibiotic Resistance Partnership

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

Infection Prevention and Control: the South African Landscape

Adriano G Duse: Chair GARP-SA

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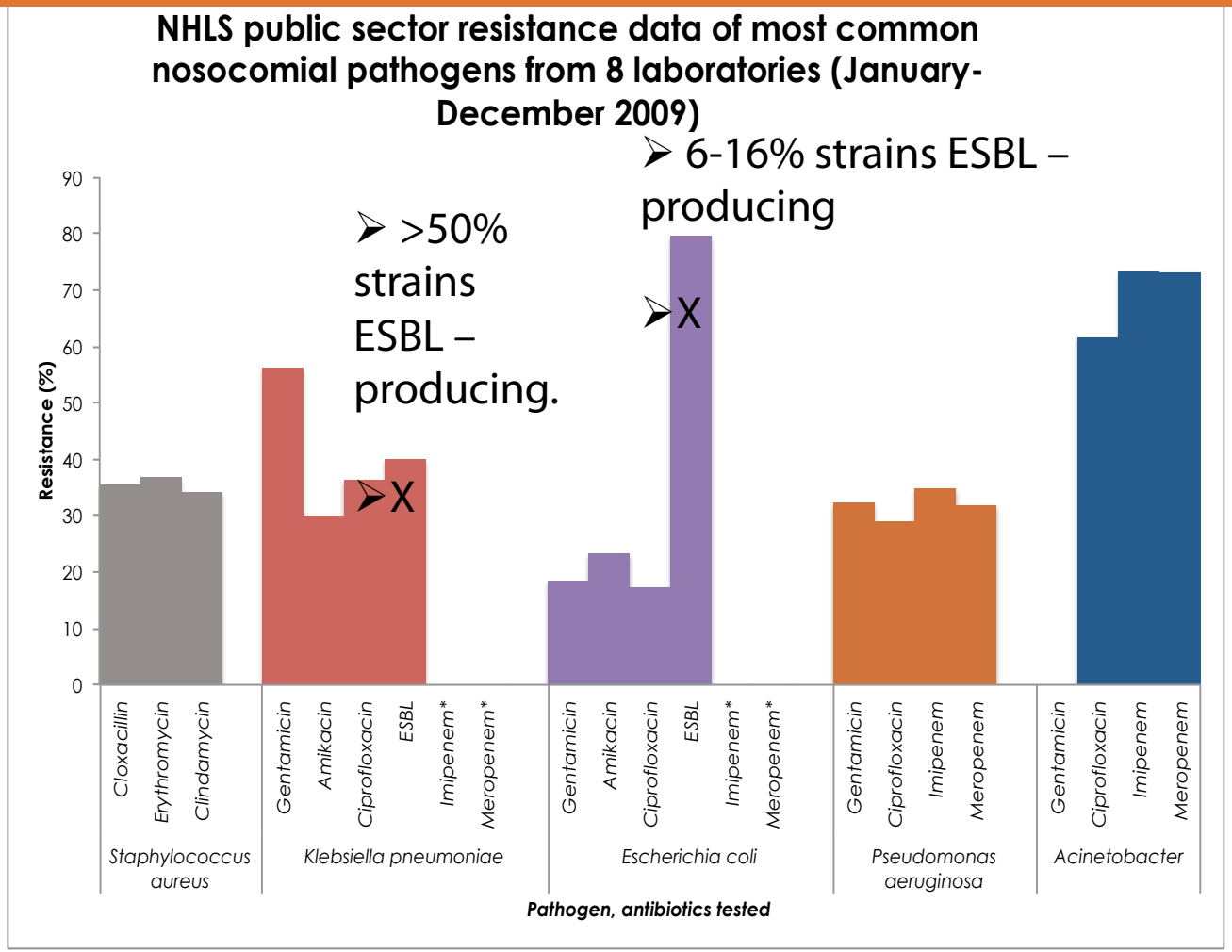
Healthcare-associated Infections (HCAIs)

- Are among the most common & serious adverse events in hospitals globally
- Occur in ~ 1 in 10 admissions overall
- Problem of HAIs bigger in developing countries: prevalence is 15.5%, at least double the overall rate in Europe & incidence in ICUs is 34.2/1000 patient days (triple the rate than in the US)
- In SA there have been, to date, no formal reporting schemes for HAIs in the public sector
- Ongoing active surveillance difficult given the shortage of infection prevention and control practitioners (IPCPs) in most facilities
- Point-prevalence surveys have, in some areas, been conducted but information derived from these is limited

There is a high rate of resistance observed in the most common nosocomial pathogens



Source: 2009 National Health Laboratory Service /NASF

Notes: * 0% resistance to imipenem and meropenem in *E. coli* and *K. pneumoniae*.

Salmonella Johannesburg

- First isolated in Johannesburg, South Africa – identified by Kauffmann & Henning (1952)
- SAIMR Annual Report 1966: alarming increase in incidence of *S* Johannesburg in Black patients from various hospitals
- Rare serotype; tendency to produce chronic infection; Strain R to commonly used antibiotics (amp, kana, tet, chlor); apparently higher infectivity
- ? Introduced in Honk Kong via imported foods; *S* Johannesburg isolated from a dog imported from SA under quarantine in 1974 in HK
- First detected in HK in 1971 (4 cases), 1972 (783), 1973 (1433), and 1974 (1411)
- Caused hospital outbreak in Hong Kong in 1974 – in a paediatric general hospital (overcrowding, heavy environmental contamination, no apparent faecal carriage in HCWs): 115 cases (1 Aug - 30 Sept 1974) – 24 (20.9%) primary admission for G/E with *S* Johannesburg; 22 of remaining initially non-infected children acquired it nosocomially (24.2% cross-infection rate) (J Hyg Camb. 1977;**78**:113-119)
- *S* Johannesburg was among the 20 most common salmonella serovars among Canadian registered commercial egg producing flocks (Epidemiol Infect 1991;**106**:259-270)

Salmonella Isangi

First described in Stanleyville "Belgian Congo" – 1947

- 1999-2001: outbreak of ESBL -producing S Isangi in paediatric wards at CHB
- March – Dec 2002:CHB Hospital : 60 cases of ESBL-producing S Isangi; 2 HCW colonised, no treatment
- May 2002: 18 children at Lambano Baby Sanctuary, 1 death – children admitted either from CHB or from Natalspruit Hospital; 3 Caretakers colonised, eradication attempted on all 3
- Interventions: IC procedure review and implementation, HCW education, ciprofloxacin administration

Wadula et al: Poster, Joint Congress of HIV Clinicians, ID, IC, Travel Medicine, STD Societies and Veterinary and Public Health, 2-6 December 2001

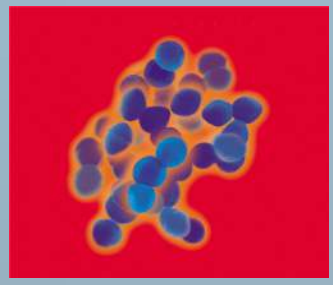
Govender et al: Poster, 23rd ICC, Durban, South Africa, 7-10 June 2003

Spread Of Resistant Clones Of GRE

- **Clonal spread** of *van*A and *van*B strains withi different hospitals

- **Interhospital** spread

- **Persistence** of one *E.faecium van*A strain within hospitals



Von Gottberg et al. Epidemiology of glycopeptide-resistant enterococci colonizing high-risk patients in hospitals in Johannesburg, Republic of South Africa. J Clin Microbiol 2000;38:905-909

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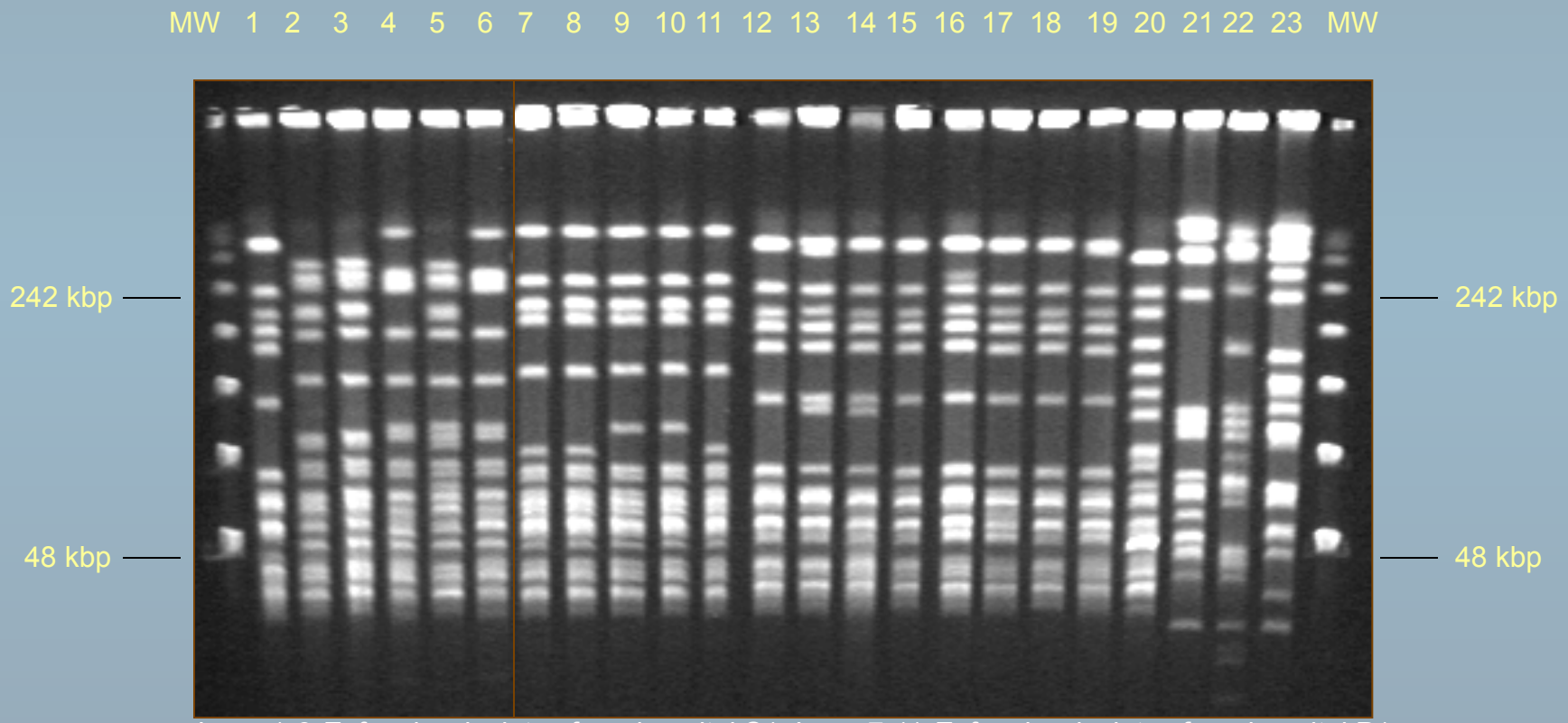
Spread Of Resistant Clones Of GRE

- Garden City 7-11
- Milpark 12-13,19
- JHB Gen 14
- Morningside 15
- Arwyp 16-17
- Mulbarton 18



Lane 1-6 *E. faecium* isolates from hospital S1, Lane 7-11 *E. faecium* isolates from hospital P1, Lane 12-13 *E. faecium* isolates from hospital P2, Lane 14-19 *E. faecium* VanA isolated from S1 in 1997 and four private hospitals in 1998, Lane 20 *E. faecium* VanA ATCC 51559, Lane 21-22 *E faecalis* Van A isolates from S1 and S2, Lane 23 *E faecalis* Van A ATCC51299

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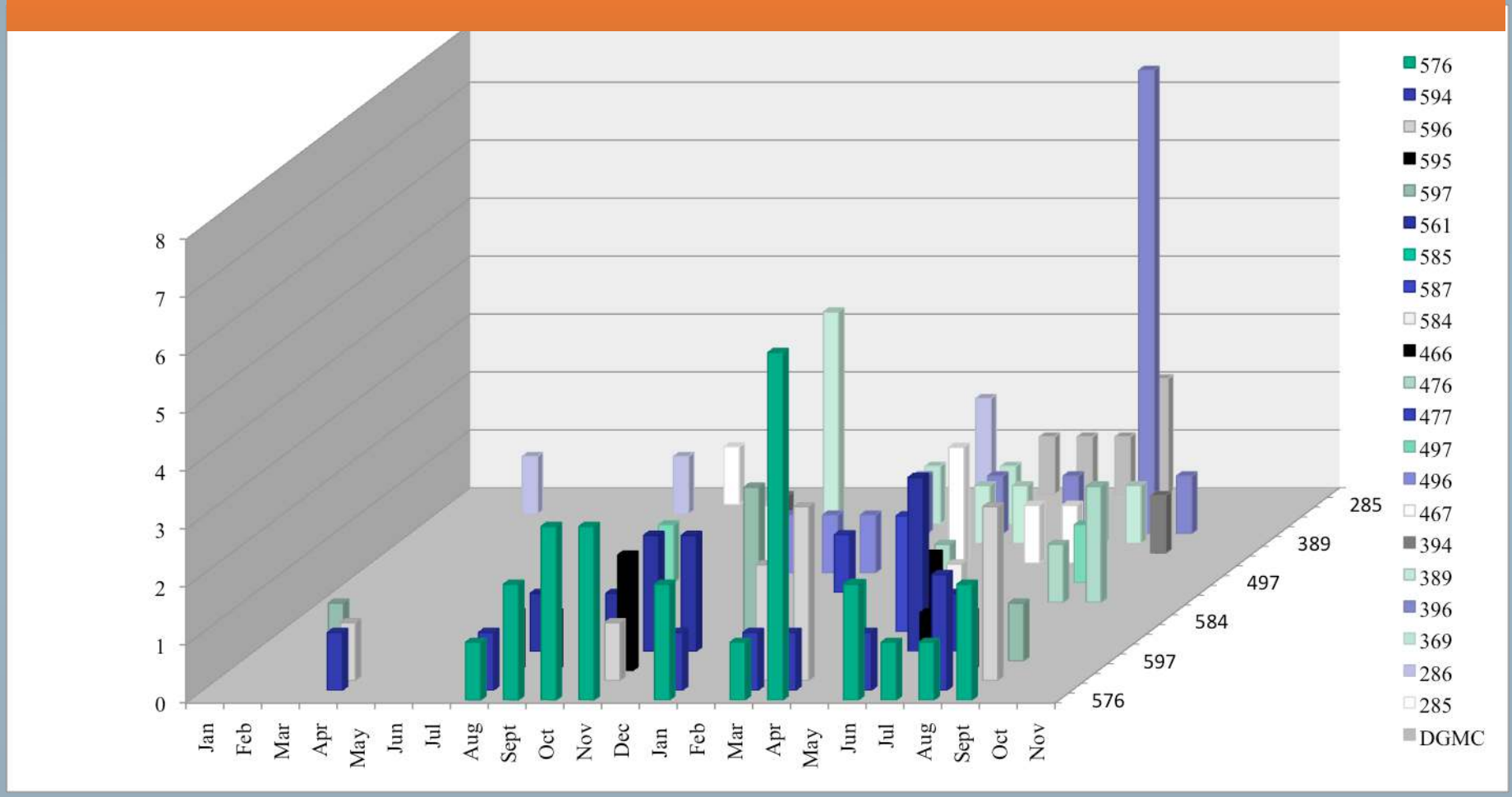
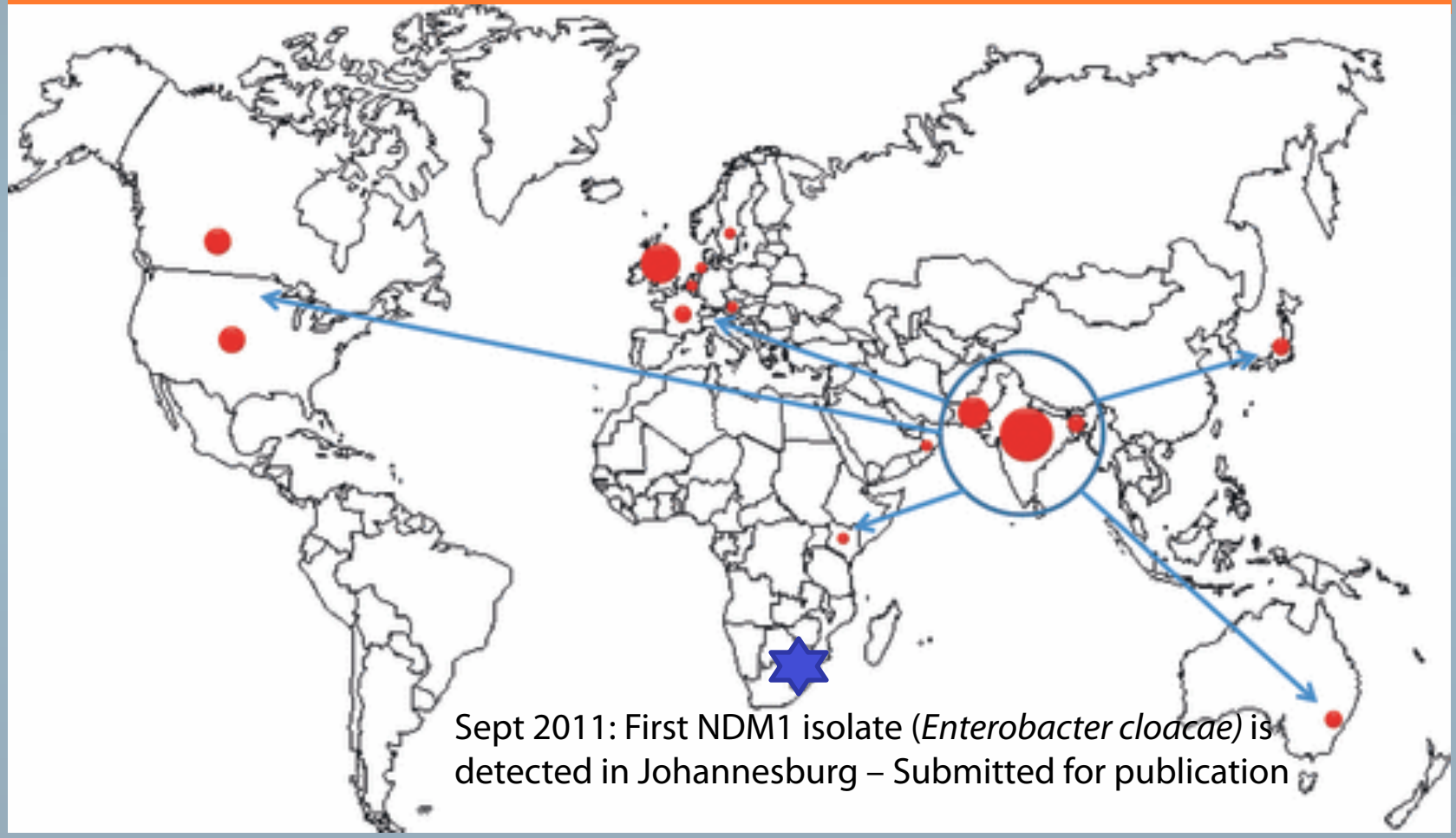
VRE – an ongoing problem



New Delhi metallo-beta-lactamase (NDM-1): towards a new pandemia?



Clinical Microbiology and Infection
Volume 16, Issue 12, pages 1699-1701, 12 NOV 2010 DOI: 10.1111/j.1469-0691.2010.03385.x
http://onlinelibrary.wiley.com/doi/10.1111/j.1469-0691.2010.03385.x/full#f1

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Outline of Presentation:

- The Problems (the status quo)
- Potential Solutions
- Current Activities

Documented (published) practices in SA that have led to breaches in IP&C:

- Overcrowding
- Inter-hospital transfer of patients colonized / infected with drug-resistant microorganisms
- Inadequate disinfection of medical equipment e.g. nasopharyngogoscopes
- Poor practices w.r.t. injection safety, sharps disposal & blood splatters
- Contamination of parenterally administered fluids, medication and supplements

Reducing HCAIs – the problems:

- Insufficient commitment of HCF managers to strengthening Infection Prevention and Control (IPC) in SA – excuse: limited resources
- Inadequate staffing & training of Infection Prevention and Control Practitioners (IPCPs); failure to relate education to practice
- Infection control procedures compromised in the face of
  - High patient throughput
  - Low staff: patient ratio
  - High level of patient movement from ward to ward
  - The 'moonlighting' phenomenon
  - Inadequate infrastructure
  - Dysfunctional procurement processes
- Insufficient unit-based instruction and supervision
- Inadequate quality control for cleaning services
- Lack of career paths for IPCPs & SANC recognition of IPC as a specialty

Reducing HCAIs –the problems:

- Insufficient expertise (especially microbiological) & leadership in IP&C
- Lack of surveillance data & failure to recognize that surveillance is the cornerstone of an IPC program and should direct its activities
- Evidence of guidelines policies but not of implementation
- Insufficient expertise (especially microbiological) & leadership in IPC
- Scant reports (with limitations) on infection prevention and control-related issues
- Outbreak responses are REACTIVE not PROACTIVE
- Evidence of guidelines & policies but not of implementation / evaluation (outcome measurements)

Some currently available Infection Prevention & Control policies and guidelines:

- Morrow BM, Argent AC, Jeena PM, Green RJ. Guideline for the diagnosis, prevention and treatment of paediatric ventilator-associated pneumonia. S Afr Med J. 2009 Apr;99(4 Pt 2):255-67.

- Brink A, Feldman C, Duse A, Gopalan D, Grolman D, Mer M, Naicker S, Paget G, Perovic O, Richards G; South African Thoracic society (SATS). Guideline for the management of nosocomial infections in South Africa. S Afr Med J. 2006 Jul;96(7 Pt 2):642-52.

- Department of Health, South Africa 2010. Healthcare acquired infections in South Africa: A national intervention programme 2010-2013

- Department of Health, South Africa, 2007.The Draft National Infection Prevention and Control Policy for TB. MDR-TB and XDR-TB

- Quality Assurance Directorate National Department of Health 2010. Obligatory list of supply needs for core infection prevention and control interventions.

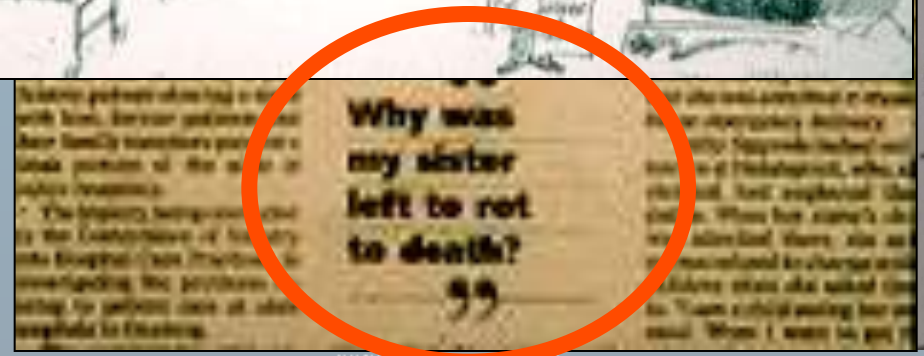
IPCP staffing & skills levels:

- In RSA currently recommended IPCP staffing level is 1 per 200 beds (draft legislation, Govt gazette, 2008)
- Recent survey (unpublished) of IPCPs throughout the country, excluding W Cape, identified 253
- Few HCFs complied with recommended ratio. In tertiary hospitals, ratio of IPCPs to acute beds was 1:400, while in smaller hospitals it ranged from 1:250-1:300
- 116/253 IPCPs were not employed primarily as IPCPs or had other primary responsibilities
- 149/253 (59.8%) had no formal IPC training. Of those that did, 78 had a certificate, 14 a diploma & 12 a BSc (Hons) in IPC

Dedicated Infection Prevention and Control Units in SA are few!

- Currently there are 4 Academic Centres with dedicated IP&C Units in SA:
  - University of the Witwatersrand / NHLS
  - Stellenbosch University
  - University of KwaZulu-Natal
  - University of Cape Town / NHLS/ NICD

Gauteng's hospitals of neglect



Fury over 'hospital from

THE PAPER FOR THE PEOPLE

WIN! Pierre Cardin hampers PAGE 3

RANDS & SENSE Manuel on SA's four-letter word BUSINESS TIMES

HEIRS AND GRACES Why Harry's crazy over local babe PAGE 3

Sunday Times

December 12 2004 / R7.50 INC. VAT

Killer bugs strike hospitals

One in seven patients at risk of picking up life-threatening infection

THE PAPER FOR THE PEOPLE

NEW TREASURES Lost Bosman works discovered P13

JULY 10 2005 / R8.50 INC. VAT

SA's deadly new plague

Top doctor warns that hospital infections could soon rival Aids and malaria

NEWS

UNDER THE MICROSCOPE: The neonatal nursery at Mahatma Gandhi Memorial Hospital where 22 babies died recently

Hospital diagnosis is no comfort to bereaved parents

NEWS

December 12 2004

Sunday Times 5

THE SUPERBUG MENACE

Worldwide alarm at virulence of bacteria

Misuse of antibiotics spawns bugs immune to every weapon in medicine's arsenal

CLAIRE KEETON and MEGAN POWER

SUPERBUGS

22 7 2005

NEWS DIVISION

Infection control services laboratory established to make hospitals safer

"With all those bugs lurking around in hospital, you may end up sicker than when you were admitted." "You risk your life going into hospital." We've all heard these comments about the hazards of entering some of our hospitals. But the possibility of acquiring an infection while in hospital is not only a local problem, nor is it limited to developing countries – it is an ongoing worldwide problem of inadequate infection control policies, costing health budgets millions in additional health care costs.

Hospital-acquired infections are frequently caused by organisms resistant to certain antibiotics. Many of these organisms take advantage of the fact that the patient is debilitated, either from underlying disease or the procedures to which the patient is subjected or from hospitalisation in general. The practice of invasive procedures and insertion of prosthetic devices may offer biological advantages for some bacteria. These problems can be controlled by the implementation of stringent infection control policies.

The value of infection control programmes is clearly shown in some first world countries where sound infection control policies are in place. In these countries both the incidence and cost of hospital-acquired infections and, in particular, the problem of antibiotic-resistant organisms are low. In many developing countries, the use of antibiotics is poorly controlled, leading to bacteria becoming resistant to the antibiotics meant to kill them. New antibiotics are then required which can considerably increase the cost of infection control. Furthermore, the rapid spread of HIV infection on the African continent, and indeed globally, has further emphasised the need for good infection control programmes.

In South Africa, the current drive towards hospital accreditation is forcing hospitals to review their infection control policies. As part of its commitment to disease prevention and management, the Department of Medical Microbiology has established the Division of Hospital Epidemiology and Infection Control, at Wits Medical School.

According to Dr Adrian Dusé, head of the Division, this service will initially operate at the Johannesburg Hospital but will, in the near future, be extended to other hospitals and related institutions in the Gauteng region.

Dr Dusé says the scope of the laboratory will include adequate infection control-related laboratory facilities and expertise, microbiological sampling of the hospital environment, specialised bacteriology, investigation of hospital outbreaks, research relating to hospital epidemiology, and education regarding laboratory aspects of infection control.

"This division will not only help maintain health standards in critical areas of the hospital, such as intensive care units, operating theatres and haemodialysis units, but it will also monitor intravenous fluids, infant feeds and water outlets for contamination. Advice on prevention of needle-stick injuries and keeping staff safe from infections will also be part of the service.

"The types of tests that will be carried out will include bacterial counts of water and air samples, en-

(to next page)

Seen at the launch of the division (left) Mrs Marilyn Britz and Mrs Yvonne Bilgeri, and below (l to r) Dr Nicola Jones, Prof Hendrik Koornhof, Dr Adrian Dusé, Dr Lucille Blumberg, Dr Suzie Budaveri and Dr Olga Perovic

SANAS
South African National Accreditation System
09.11.2004 14:40

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DAMNATION …

SALVATION …

THE PRESENCE OF PATHOGENIC BACTERIA IN COMMERCIALLY AVAILABLE POULTRY IN SOUTH AFRICA

N Aithma, W van Nierop, A G Duse, M Kassel, A Potgieter, N Thothobolo, B Fernandes, R Stewart
Division of Hospital Epidemiology and Infection Control, National Health Laboratory Service and School of Pathology of the University of the Witwatersrand, Johannesburg, South Africa


10.02.2004 12:21


10.02.2004 12:19


10.02.2004 12:21

The Role of Molecular Techniques in the Epidemiology of Potential Nosocomial Pathogens

B. Ahmadou Ahidjo, E. Marais and AG Duse
University of the Witwatersrand and the National Health Laboratory Service

INTRODUCTION

mial infections are increasingly recognised as a serious problem in developing countries. e primarily caused by the contamination of hands of health-care workers, medical nt and infusates with pathogenic bacteria[1,2,3,4]. Molecular techniques can be used in the on of the source of infection and epidemiology of pathogens.

sion of Hospital Epidemiology and Infection Control employs macro-restriction analysis, a sed method with standardised interpretation guidelines, and Arbitrarily Primed Polymerase eaction (AP-PCR) - also known as Randomly Amplified Polymorphic DNA (RAPD) - for logical purposes.

ances of the use of these techniques in the investigation of outbreaks and contamination l products are presented here.

AIM

ght the utility of macro-restriction analysis and AP-PCR in the study of nosocomial s.

CASE 2: Fatal Contamination[5]

A fatal outbreak of *Serratia odorifera* Biotype 1 occurred in four hospitals in Johannesburg, and was linked to the use of intravenous parenteral nutrition. AP-PCR was performed on the isolates to determine if the contamination of the infusates given to the patients was intrinsic (pre-existing in the product) or extrinsic (during adminstration).

Isolates used for the AP-PCR were obtained from patients as well as the environment i.e. infusates and surface swabs at the manufacturing facility.

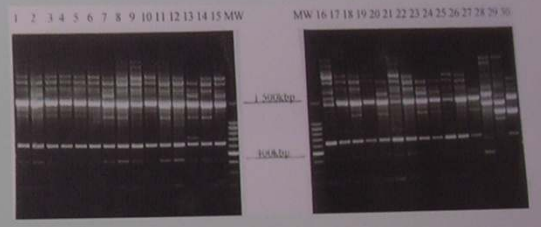


Figure 1. Gel showing AP-PCR of *Serratia odorifera* Biotype 1 DNA isolates using primer HWL 74

ON ANALYSIS FOR THE N OF OUTBREAKS OF ENTEROCOLITIS

SEL, A. DUSE, M NICOL, W VAN NIEROP
outh African Institute for Medical Research and the Wits School of Pathology

Klebsiella pneumoniae

An outbreak of NEC occurred during April and May 1998 in tertiary health care institution. *K. pneumoniae* with extende beta-lactamase activity was isolated from the blood cultur of 7 neonatal infants (2). Macro-restriction analysis w performed on isolates of *K. pneumoniae* during the course the outbreak (Figure 1). This proved to be a useful educatior tool to highlight the importance and effectiveness infection control implementation. The technique was used distinguish outbreak from non-outbreak *K. pneumoni* isolates from other wards in the hospital.

PSEUDO-OUTBREAK OF *BURKHOLDERIA CEPACIA* IN CYSTIC FIBROSIS PATIENTS AT JOHANNESBURG HOSPITAL

O. Perovic, A. Duse, R. Stewart, D
Department of Clinical Microbiology and Infectious Diseases, SAIM

INTRODUCTION

Burholderia cepacia, originally described as a plant pathogen, has become an important opportunistic pathogen in patients with cystic fibrosis (CF) and an infrequent cause of nosocomial infection in patients without CF (1). There is increased evidence of transmission among patients with CF by social contact; the environment is also a potential source. One risk factor for *B. cepacia* acquisition by patients with CF appeared to be hospitalisation (2).

Most of *B. cepacia* are resistant to many, if not all, of the antibacterial agents commonly used in cystic fibrosis (3). Selection of appropriate antibiotics for treatment of pulmonary "cepacia syndrome" is very difficult (4,5).

A number of *B. cepacia* isolates from CF patients were isolated in our laboratory, which were all sensitive to antibiotics tested for this organism. This outbreak of *B. cepacia* in CF Unit was studied in Infection Control Services at Johannesburg hospital.

METHODS AND RESULTS

TRANSMISSION OF CARBAPENEM RESISTANT *A. BAUMANII* IN A TRAUMA INTENSIVE CARE UNIT

MRB Maloba[1], A Duse[1], W Van Nierop[1], G Sharp[2], F Brown[2], W Mangwedi[2], J Goosen[3]
[1]Division of Hospital Epidemiology and Infection Control, Department of Clinical Microbiology and Infectious Diseases, NHLS and School of Pathology of t University of the Witwatersrand, Johannesburg, South Africa, [2]Department of Infection Control, Johannesburg Hospital, South Africa, [3]Trauma Unit, Johannesburg Hospital, South Africa

INTRODUCTION

er a one year period (June 2000 to July 2001) it s noted that approximately 35% of 193 *A. umanii* isolates from patients admitted to the auma ICU (TICU) of an academic hospital in hannesburg were resistant to carbapenem tibiotics (imipenem and meropenem). During a week period (14 June 2001 to 19 July 2001) eight tients were noted to be colonised and/or infected th carbapenem resistant *A. baumanii*. The high mber of carbapenem resistant isolates, and the spicion of an outbreak due to the clustering of w colonised and/or infected patients prompted a brough infection control investigation that was tiated at the beginning of July 2001.

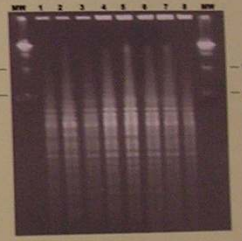
RESULTS AND DISCUSSION

Table 1 summarises patient characteristics from whom carbapenem resistant *A. baumanii* strains were isolated.

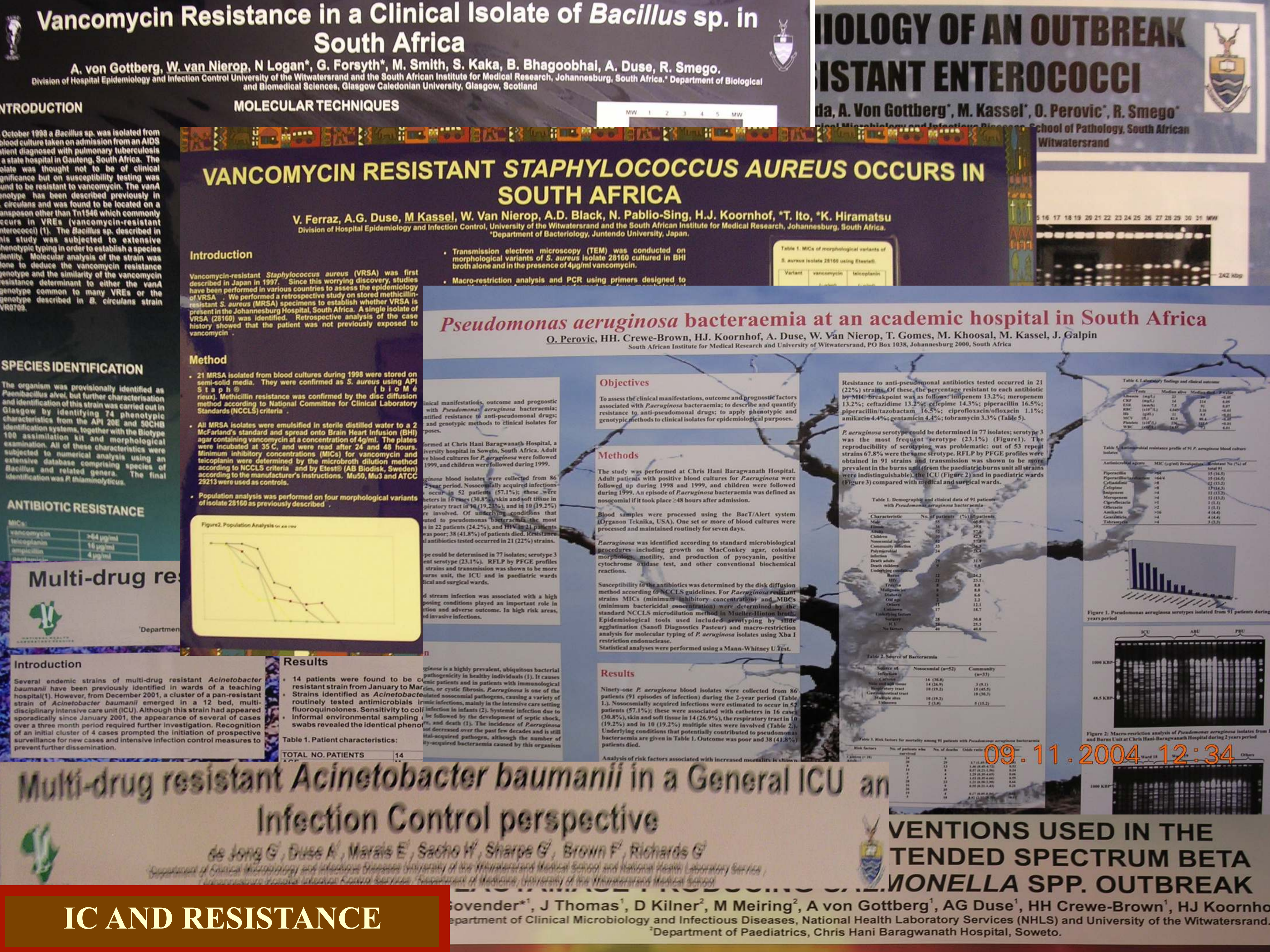
Table1. Characteristics of patients colonised and/or infected with carbapenem resistant *A. baumanii* strains (n =8)

Age (known for 5/8 patients)	25yrs – 56yrs (mean=40yrs)
Median duration of stay in TICU	10 days

Figure2. PFGE patterns of 8 carbapenem-resi *A. baumanii* isolates



INTERPRETATION OF PFGE RESULTS



IC AND RESISTANCE

Some current activities:

- Surveillance Education and Training
- Antimicrobial Stewardship - The Global Antimicrobial Resistance Partnership (GARP)
- Best Care…Always! Campaign
- Education & Training

Infection Prevention and Control and antibiotic stewardship: the global antimicrobial resistance partnership (GARP) initiative

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Anti-infectives resistance policy strategies:

- Strategies that reduce demand
  - Extending the therapeutic life of existing drugs by reducing need for anti-infectives – antibiotic stewardship
    - Reduction of anti-infectives prescribing + ? other strategies: topical, antimicrobial impregnated devices, immunomodulation, probiotics)
    - Lower burden of infections and therefore need of antimicrobials (immunization, infection prevention and control)
    - Determine role of cycling, combination therapies & antibiotic heterogeneity, to delay emergence and spread of resistance
- Strategies that address supply
  - Development of new antimicrobials
  - Reduce incentives to oversell existing drugs

THE BEST CARE ALWAYS (BCA) CAMPAIGN INITIATIVE

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Best Care…Always (BCA):

- Launched in 2009, initially primarily as a collaboration with the private sector
- Currently it is also being implemented in public sector (Gauteng, W Cape, Free State)
- Purpose: improve healthcare (& reduce HAIs) for prevention of VAP, CLABSI, CAUTI & SSI by using 'bundle' care packages; also involved in antibiotic stewardship programs
- 192 SA hospitals implementing 1/more 'bundle' care packages
- Success stories have been reported in relation to reduction of certain HAIs but none have yet been reported in the scientific literature

Infection Prevention and Control training initiatives

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Infection Prevention and Control training courses:

- University of the Witwatersrand (IPC certificate, postgraduate diploma, MScMed in the field of IPC) *
- Stellenbosch University (IPC certificate, postgraduate diploma)
- University of KZN (IPC certificate, BSc Hons) *
- Other centres offering IPC certificates: NetCare, Life healthcare and MediClinic hospital groups

*: Have been tasked by NDoH to develop a single standardized curriculum & training program for IPCPs countrywide. Commencement: August 2011

Infection Prevention & Control (IPC) training at Wits:

- Certificate in Infection Prevention & Control ['Infection Prevention and Control at the Cutting Edge'] – 1 year: 4, one-week training modules

- Advanced Diploma in Nursing (Infection Control) – above plus additional year in Department of Nursing Education, FHS, Wits University

- MSc (Med) in Infection Prevention and Control – 2 years by course work + research report. From 2012.

- FOR MORE INFORMATION, CONTACT DETAILS FOR PROF A G DUSE ARE: Adriano.Duse@wits.ac.za

Potential solutions:

- Urgent need to increase the pool of adequately trained IPCPs
- Training opportunities need to be increased
- Management must be made to see the importance of IPC – IPC Training of Managers absolutely vital
- Identification and ring-fencing of appropriate funding
- IPC job descriptions must be developed and endorsed nationally and regionally
- Address the creation of IPCP career paths
- Develop and implement a national strategy for HAI surveillance: prevalence, incidence

Thank you !

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