The Current Scenario & Challenges in KZN MDR-TB management

I H Master
26/09/2013
Provincial map showing DR-TB Service platforms.

Compiled and Produced by
VHA Unit
DEN Health Department
Stellenbosch/2016
## Total MDR/XDR Beds KZN

<table>
<thead>
<tr>
<th>DISTRICT</th>
<th>HOSPITAL</th>
<th>Operational</th>
<th>BEDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZULULAND</td>
<td>THULASIZWE</td>
<td>2008</td>
<td>65</td>
</tr>
<tr>
<td>ETHEKWINI</td>
<td>KING DINIZULU (32 paed)</td>
<td>2000</td>
<td>224</td>
</tr>
<tr>
<td></td>
<td>FOSA</td>
<td>2007</td>
<td>167</td>
</tr>
<tr>
<td>UMKHANYAKUDE</td>
<td>MANGUZI</td>
<td>2009</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>HLABISA</td>
<td>2012</td>
<td>85</td>
</tr>
<tr>
<td>UMZINYATHI</td>
<td>GREYTOWN</td>
<td>2007</td>
<td>37</td>
</tr>
<tr>
<td>UGU</td>
<td>MURCHISON</td>
<td>2007</td>
<td>40</td>
</tr>
<tr>
<td>UTHUNGULU</td>
<td>CATHRINE BOOTH</td>
<td>2010</td>
<td>40</td>
</tr>
<tr>
<td>SISONKE</td>
<td>ST MARGARET’S</td>
<td>2012</td>
<td>30</td>
</tr>
<tr>
<td>UMGUNGUNDLOVU</td>
<td>DORIS GOODWIN</td>
<td>2011</td>
<td>64</td>
</tr>
<tr>
<td>PROVINCIAL</td>
<td></td>
<td></td>
<td>752</td>
</tr>
</tbody>
</table>

- MDR units in 8 of 11 District
  - Require units in Ilembe, Amajuba, Uthukela
KZN/KGV – Management Policy

• 2 streams of care at KGV/KZN for new patients
• Admitted cases - kept for 6 months.
  • XDR and ill patients are prioritized
  • Discharges are allowed for
    • Social issues / Aggressive patients / Extreme pressure on beds
• Outpatients – Started on MDR treatment at MDR Clinic
  • Some admitted to district hospital / TB centres (for a period)
  • Some treated purely at clinic level
    • Refuse to be admitted
    • Treatment failures being retreated
  • Needs commitment from referring party to supervise treatment
  • In ideal circumstances only stable, less infectious patients (smear neg.)
    • Above is in Line with National decentralised policy
    • It is applied differently at facilities depending on waiting list
Patient Profile

- Exclusively MDR and XDR
- Currently 90 XDRs admitted
- > 70 % HIV positive

MDR follow up Clinic

- Discharged patients attend monthly. (Tue/Thur).
- 250- 400 patients/clinic = 2500/month.
- New outpatients initiated are seen on Mon/Wed/Fri

- +/-180 MDR started on Rx per month
- Averaging 45 new patients per week
  - +/- 30 outpatients / week
  - +/- 20 admissions / week
## Current Waiting List – KGV

<table>
<thead>
<tr>
<th>Waiting List 24/9/2013</th>
<th>Pat. Nos.</th>
<th>Waiting Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males – awaiting beds</td>
<td>40</td>
<td>3 Weeks</td>
</tr>
<tr>
<td>Females – awaiting beds</td>
<td>25</td>
<td>2 Weeks</td>
</tr>
<tr>
<td>New Outpatients awaiting Rx</td>
<td>38</td>
<td>10 days</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td></td>
</tr>
</tbody>
</table>

- 103 patients waiting for treatment
- > 65% are started as outpatients
DR Treatment Regimen

- **Standard MDR – new MDR**
  - 6/12 months injectable (minimum) - (4/12 post culture conversion)
    - Moxi /Ethio/Terizidone/PZA/Kana (Amikacin)
  - 18 months continuation (minimum)
    - Moxi/Ethio/Terizidone /PZA

- **Standard XDR – new XDR**
  - 6/12 months injectable (minimum)
    - Moxi/Ethio/Terizidone /PZA/ Capreol/PAS/Clofazamine
  - 18 months (minimum)
    - Moxi/Ethio/Terizidone /PZA/ PAS/Clofazamine
DR Treatment Regimen

Individualized treatment in MDR/XDRs previously exposed to 2\textsuperscript{nd} line drugs

- If a drug is used for more than a month (with persistent positives), assume probable resistant
- Add group 5 drugs to the core regimen
  - Augmentin/Klacid/High dose INH / ?Linozolid/?Imipenam
PRE - XDR & Rx Principals

Resistance to INH + RIF + Ofloxacin (quinolones)
- Add PAS +/- Clofazamine to MDR regimen

Resistance to INH + Rif + Kanamycin
- Add Capreomycin/PAS +/- Clofazamine to MDR regimen

General Principals
- Always have 4 drugs expected to be sensitive
- Never add a single drug to a failing regimen
- If at any time a drug cannot be used, replace it with an equal drug.
  - eg
    - If Kanamycin stopped - add PAS
    - If Terizidone stopped add PAS / Clofazamine
Advice for Treatment Failures

- KZN situation
  - We have many treatment failures (> 300)
  - They are discharged home
  - Some survive >5 years

- Plan For Failures
  - Complete adequate course of treatment (12-24 mths)
  - If failing Rx (6 –12mths) add what has not been used
    (Capreomycin, PAS, Klacid Augmentin, Moxifloxacin, Clofazamine /Linozolid/TMC 207)
  - Stop all treatment if definite Rx. failure. (after 2 years)
  - Palliative treatment, sanatorium or home based care. (no current capacity)
<table>
<thead>
<tr>
<th>Drug</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linozolid (600mg od)</td>
<td></td>
<td></td>
<td></td>
<td>R 9000</td>
<td></td>
</tr>
<tr>
<td>PAS (4g BD)</td>
<td>R1600</td>
<td>R 2360</td>
<td>R2358</td>
<td></td>
<td>R 1853</td>
</tr>
<tr>
<td>Capreomycin (1g 5x)</td>
<td>R800</td>
<td>R 1300</td>
<td>R2391</td>
<td></td>
<td>R 1742</td>
</tr>
<tr>
<td>Terizidone (250mg tds)</td>
<td>R650</td>
<td>R 579</td>
<td>R566</td>
<td>R 607</td>
<td></td>
</tr>
<tr>
<td>Kanamycin (1g 5x)</td>
<td>R250</td>
<td>R 200</td>
<td>R239</td>
<td>R 242</td>
<td></td>
</tr>
<tr>
<td>Laevofloxacin (1gram) OD</td>
<td></td>
<td></td>
<td></td>
<td>R 210</td>
<td></td>
</tr>
<tr>
<td>Clofazamine (300mg) OD</td>
<td></td>
<td></td>
<td></td>
<td>R204</td>
<td>R 200</td>
</tr>
<tr>
<td>Amikacin (1g 5x)</td>
<td>R400</td>
<td>R 216</td>
<td>R223</td>
<td>R 192</td>
<td></td>
</tr>
<tr>
<td>Augmentin (1g BD)</td>
<td>R130</td>
<td>R 177</td>
<td>R191</td>
<td>R 138</td>
<td></td>
</tr>
<tr>
<td>Ethionamide (250mg tds)</td>
<td>R130</td>
<td>R 177</td>
<td>R191</td>
<td>R 138</td>
<td></td>
</tr>
<tr>
<td>Klacid (500mg BD)</td>
<td>R 228</td>
<td>R123</td>
<td>R123</td>
<td>R 121</td>
<td></td>
</tr>
<tr>
<td>Moxifloxacin (400mg OD)</td>
<td>R 800</td>
<td>R911</td>
<td>R 114</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ofloxacin (800mg OD)</td>
<td>R60</td>
<td>R 54</td>
<td>R349</td>
<td>R 112</td>
<td></td>
</tr>
<tr>
<td>Rifafour (4 BD)</td>
<td>R80</td>
<td>R 67</td>
<td>R67</td>
<td>R 57</td>
<td></td>
</tr>
<tr>
<td>Rifanah (300 – 2 BD)</td>
<td>R 40</td>
<td>R42</td>
<td>R42</td>
<td>R 45</td>
<td></td>
</tr>
<tr>
<td>PZA (1,5gm OD)</td>
<td>R50</td>
<td>R 42</td>
<td>R33</td>
<td>R 44</td>
<td></td>
</tr>
<tr>
<td>EMB (1,2 OD)</td>
<td>R 38</td>
<td>R43</td>
<td>R43</td>
<td>R 44</td>
<td></td>
</tr>
<tr>
<td>Ciprobay (1,5gm) OD</td>
<td>R36</td>
<td>R 32</td>
<td>R36</td>
<td>R 41</td>
<td></td>
</tr>
</tbody>
</table>
## Drug Costs

<table>
<thead>
<tr>
<th>Drug (&gt; 50KG)</th>
<th>Cost (per patient per month)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>STD TB (intensive phase)</td>
<td>R67</td>
</tr>
<tr>
<td>STD TB (continuation phase)</td>
<td>R42</td>
</tr>
<tr>
<td>MDR (intensive phase)</td>
<td>R1207</td>
</tr>
<tr>
<td>MDR (continuation phase)</td>
<td>R968</td>
</tr>
<tr>
<td>XDR (intensive phase)</td>
<td>R6654</td>
</tr>
<tr>
<td>XDR (continuation phase)</td>
<td>R4263</td>
</tr>
</tbody>
</table>
Paucibacillary disease - (seldom culture-positive)

Education and counselling of the patient / family is critical

As yet no prophylaxis for child contacts of DR TB patients

- **Still current policy of WHO/ SA TB program**
  - Using a Weak regimen, were TB not excluded, may create Pre-XDR TB
  - If active TB, better to treat with contacts DST. (where unable to confirm).

- **Different policy current in Western Cape**
  - Prophylaxis under discussion in WHO (Prof Schaaf)

Using Laevofloxacin in children < 8 years
Paediatric MDR Patients treated 1998 – 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>1</td>
</tr>
<tr>
<td>1996</td>
<td>0</td>
</tr>
<tr>
<td>1997</td>
<td>6</td>
</tr>
<tr>
<td>1998</td>
<td>3</td>
</tr>
<tr>
<td>1999</td>
<td>3</td>
</tr>
<tr>
<td>2000</td>
<td>5</td>
</tr>
<tr>
<td>2001</td>
<td>4</td>
</tr>
<tr>
<td>2002</td>
<td>8</td>
</tr>
<tr>
<td>2003</td>
<td>13</td>
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<td>2004</td>
<td>19</td>
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<td>2005</td>
<td>24</td>
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<td>2006</td>
<td>26</td>
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<tr>
<td>2007</td>
<td>41</td>
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<tr>
<td>2008</td>
<td>50</td>
</tr>
<tr>
<td>2009</td>
<td>78</td>
</tr>
<tr>
<td>2010</td>
<td>100</td>
</tr>
<tr>
<td>2011</td>
<td>76</td>
</tr>
<tr>
<td>2012</td>
<td>101</td>
</tr>
</tbody>
</table>

Total 14
Negatives of Paediatric program

- Many Contacts not investigated
- Gastric washings not taken at clinic level
- Lack beds capacity to admit everyone
  - Some treated as outpatients
- Some deteriorate or default on discharge
  - Poor socioeconomic conditions
  - Inadequate support / Lack of caregiver
  - Ignorance
# Retrospective Review of Children < 15 treated at KGV - Jan 2009 to Jun 2010 (18 months)

<table>
<thead>
<tr>
<th></th>
<th>(84 Patients)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDR</td>
<td>93% (78)</td>
</tr>
<tr>
<td>XDR</td>
<td>7% (6)</td>
</tr>
<tr>
<td>HIV infected</td>
<td>77% (64)</td>
</tr>
<tr>
<td>On ARVs</td>
<td>97% (62/64)</td>
</tr>
<tr>
<td>Median Age</td>
<td>8 years</td>
</tr>
<tr>
<td>Median duration treated</td>
<td>21 months</td>
</tr>
</tbody>
</table>

- **Study submitted as Poster**
  - Hicks Robert, Padayatchi, Shah, Wolf, Werner, Sunkari, O’Donnell from Albert Einstein / Caprisa
- **Preliminary analysis**
### Outcomes of Study

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>84 patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favourable outcomes</td>
<td>79% (66)</td>
</tr>
<tr>
<td>Cured</td>
<td>60% (50)</td>
</tr>
<tr>
<td>Completed</td>
<td>19% (16)</td>
</tr>
<tr>
<td>Default</td>
<td>6% (5)</td>
</tr>
<tr>
<td>Failed</td>
<td>5% (4)</td>
</tr>
<tr>
<td>Died</td>
<td>11% (9)</td>
</tr>
</tbody>
</table>

- All deaths were in HIV pos patients (9)
- Most were malnourished (8/9)
DR/TB AND HIV

HCT must be offered to all DR/TB patients.

HIV in DR-TB is associated
- Higher mortality (advanced HIV & TB disease, more OIs)
- More adverse events
- More Drug interactions / overlapping toxicities
- More smear neg disease
- Poor adherence (multiple meds)

ART in DR-TB, HIV infected, improves outcomes

If HIV + MDR/XDR- add ARVs after 2 weeks
- Especially if CD4 low (<50)

Already on ARVs – just add MDR treatment
TDF to use or not in DR/TB

- Specialists in Gauteng and West Cape concerned about TDF with Aminoglycosides
  - Different opinion from other specialists / sites
- MDR Guidelines - recommend stopping TDF when on aminoglycosides
- Discussion with National – can use if renal function monitored carefully
- Are we monitoring renal function adequately ???
- Have we had a significant increase in Renal problems with TDF and aminoglycosides????
- More data is required!!!!
Limited options for XDRs, Pre-XDR and MDR treatment failures

- **New Drugs (few years)**
  - Bedaquiline – unregistered – limited access
  - Delaminid - being tested

- **New regimens**
  - Stream study - testing 9 month regimen – uses clofazamine

- **Current options**
  - Linozolid
    - Promising outcomes
    - Limited access
    - Prohibitive cost (> R300 / Tablet)
    - Need to lobby for cheaper imports
Data & MDR

A Few sources – serious issues in Monitoring & reporting

Electronic Drug Register – (EDR)
- Not enough Data capturers
- Many initially entered as Mono Resistant
- Outcomes poorly updated

Manual register
- Not well rolled out
- Many not counting Gene Xpert not confirmed on DST

NHLS Database - ? duplicates
MDR and XDR in KZN – from EDR 2009 onwards
MDR and XDR in KGV from EDR from 2009

Total Patients

MDR

OP

XDR

0 200 400 600 800 1000 1200 1400 1600 1800 2000


MDR and XDR in KGV from EDR from 2009
KGV - MDR OUTCOMES Jan 2009 to Dec 2010 – DST confirmed

Data supplied by Thembi / KI Ntuli keeps TB register

- Defaulted: 10%
- Rx Success: 60%
- Died: 9%
- Failed: 19%
- Transfer: 2%

Pie chart showing:
- Rx Success: 60%
- Failed: 19%
- Died: 9%
- Defaulted: 10%
- Transfer: 2%
Male vs Female for All TB KGV

MDR

Females 53%
Males 47%

Males
Females

Male vs Female for All TB KGV

Females
Males
47%
53%
MDR
HIV in King George Patients 2012 (EDR)
XDR Outcomes - Jan 2009 to Dec 2010 - DST confirmed

- Died: 31 (22%)
- Transfer: 22% (0%)
- Defaulted: 11% (34%)
- Rx Success: 33% (FAILED: 34%)

Data supplied by Thembi / KI Ntuli
Health Care Workers Treated at KGV for Resistant TB

- Most of the patients were referred by General Hospitals
- They were not from TB hospitals or from KGV
- Most of the staff were immuno-compromised
- The risk of MDR TB may well be higher in a general hospital
WHO Recommendations for Gene Expert

High Burden MDR-TB & HIV associated TB (SA)

Gene Expert
The implications
DIAGNOSTIC ALGORITHM

- **TB SUSPECTS**
  - **TB and DR-TB contacts, non-contact symptomatic individuals, re-treatment after relapse, failure and default**
  - Collect one sputum specimen at the health facility under supervision

- **GXP positive**
  - **Rifampicin sensitive**
    - Treat as TB
    - Start on Regimen 1
    - Send one specimen for microscopy
  - **Rifampicin resistant**
    - Treat as MDR-TB
    - Refer to MDR-TB Unit
    - Collect one specimen for microscopy and LPA

- **GXP negative**
  - **Rifampicin unsuccessful**
    - Collect one specimen for culture and LPA or culture and DST (for R and H)
  - **HIV positive**
    - Treat with antibiotics
    - Review after 5 days
    - Do chest x-ray
  - **HIV Negative**
    - Treat with antibiotics
    - Review culture results

- **Follow up with microscopy**

- **Poor response to antibiotics**
  - Clinically TB
  - TB on chest x-ray

- **LPA/ DST results**
  - Resistant to R and H/ R only

- **Follow up with microscopy and culture**

- **Good response**
  - No further follow up
  - Advise to return when symptoms recur

- **Poor response**
  - Consider other diagnosis
  - Refer for further investigation

- **Treat as MDR-TB**
  - Refer to MDR-TB Unit
Practical Issues Around GeneXpert

• **Advantages**
  - Rapid screening for TB & MDR TB
  - Of value smear negative TB
  - Point of Care

• **Disadvantages**
  - Cost is significant (at present)
    - Does not replace any test - additional cost
    - Results still need to be confirmed with DST
  - Little value in monitoring MDR TB
  - Cannot identify XDR TB
  - ? Degree of False positives & unconfirmable results
<table>
<thead>
<tr>
<th>Treatment</th>
<th>DST confirms Gene Xpert/Rif resis.</th>
<th>60.2%</th>
<th>8.2%</th>
<th>68.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rif Resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Treatment Inappropriate                       |                                   |       |      | 15.3% |
| Discordant Gene Xpert /Missed Info/          |                                   |       |      |       |
| Missed XDR/Pre XDRs                          |                                   | 8.2%  |      |       |
| DST - Rif sensitive                          |                                   | 3.6%  |      |       |
| MOTT                                          |                                   | 1.5%  |      |       |
| INH Mono                                      |                                   | 1%    |      |       |

<p>| Unconfirmable Gene Xpert                     |                                   |       |      | 17.4% |
| Neg Cultures                                 |                                   | 9.2%  |      |       |
| No DST processed                             |                                   | 8.2%  |      |       |</p>
<table>
<thead>
<tr>
<th>Xpert Result</th>
<th>DST</th>
<th>National Advise</th>
<th>KDHC Policy</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rif R</td>
<td>MDR or Rif Mono</td>
<td>MDR treatment Add INH (if R mono)</td>
<td>Agree</td>
<td></td>
</tr>
<tr>
<td>Rif R</td>
<td>NO DST / Culture Neg</td>
<td>Continue MDR</td>
<td>Agree ? Shorten duration</td>
<td>Cannot disprove Gene Xpert</td>
</tr>
<tr>
<td>Rif R</td>
<td>Discordant R Sensitive TB + MDR</td>
<td>Continue MDR/ More DST</td>
<td>Agree</td>
<td>Changing DST / mixed colonies. Chronic TB more likely to be MDR</td>
</tr>
<tr>
<td>Rif R</td>
<td>Sensitive TB</td>
<td>Stop MDR, start STD TB treatment</td>
<td>IF new TB stop MDR. Repeat DST Chronic TB continue MDR.</td>
<td></td>
</tr>
<tr>
<td>Rif R</td>
<td>INH mono resistance</td>
<td>? More DST ? Stop MDR add Rif</td>
<td>? Continue MDR add Rifampacin Review after more DSTs</td>
<td></td>
</tr>
<tr>
<td>Rif R</td>
<td>XDR / Pre XDR</td>
<td>XDR Rx – consider BDQ</td>
<td>Agree</td>
<td></td>
</tr>
</tbody>
</table>
Bedaqualine access program

Compassionate usage of Bedaqualine (TMC207) was initially stopped by the MCC.

Following representation from National TB program, MCC allowed usage of Bedaqualine in XDR and PreXDR patients under research conditions.

It is a National DR TB program that will be run like a trial with support from NGOs (MSF, Right to Care, MRC).

Drugs for 200 patients to be provided by Jansen.
Program Requirements

Protocol accepted by MCC must be adhered to

- All sites monitored and screened by my National TB
- Suitable candidates with Informed Consent
- Screening by
  - National expert Committee
  - Jansen committee
  - MCC - Section 21 forms
- Baseline bloods
- Regular ECG monitoring
- A/E reporting
Patient Inclusion Criteria

- Signed informed consent
- Laboratory confirmed pre-XDR and XDR-TB
- Good adherence to TB treatment in past (Reliable)
- Above ≥18 years of age
  - Negative pregnancy test
- Background Regimen of at least 3 sensitive drugs (or likely to be)
- Agreeable to a double contraceptive methods (male and females)
  - Or Sterile / Post-menopausal for 2 years
Patient Exclusion Criteria

- Significant other Co-Morbidities or Disease
- Complex Extrapulmonary TB
- Patients with the laboratory abnormalities
  - Serum creatinine / Lipase / AST / B/R
- ECG changes / QTcF interval > 450 msec
Bedaquiline

- 400 mg (daily) for 2 weeks
- 200 mg (3 times a week) for 22 weeks
- Background regimen (BR) of 2nd line drugs (XDR/Pre-XDR) to be continued beyond the 24 weeks.
Bedaquiline issues

- Not a wonder drug and cannot be used alone
- Careful screening - Not for XDR treatment failure
- Has a long half life – (5 ½ months).
  - If a patient defaults - resistance will easily develop
- It works through some of the cytochrome pathways.
  - Drug interactions occur
- QT prolongation - ECG monitoring required
- Avoid ARVs like EFV - switch to NVP or Alluvia
- QT issues with Clofazamine & Moxifloxacin
  - Switch to Laevofloxacin (instead of Moxifloxacin)
- Adverse event monitoring
ARE WE FAILING OUR MDR PATIENTS
HAVE WE TRIED OUR BEST
WHERE DO WE FAIL PATIENTS

- Failure to Counsel Patients & family
  - A informed & supported patient is more compliant

- Incorrect Drug and Dosage selection
  - Results in adverse events and treatment failure

- Failure to monitor Bloods + Hearing
  - Results in morbidity & Mortality (Renal/Deafness)

- Failure to Assess Risk Factors & manage Co-Morbidities
  - Results in Morbidity & Mortality (D/M, Hepatic, HIV)

- Failure to check Sputum Results
  - Results in inappropriate treatment (missed XDR)

- Failure to monitor /Treat Side Effects
  - Results in poor compliance
DO NOT FAIL YOUR PATIENTS!

It's like stabbing them in the back!

I H MASTER
Achievements - KZN 2013

- Improving treatment outcomes – cure rate
- 122 outreach teams TB/DR-TB/HIV
- Established 3 decentralized MDR-TB units
- 62 operational GeneXpert machines
- Established a provincial TB/DR-TB Technical Task team 2013 – quarterly
- Nurse initiated program commenced
Challenges in Current KGV Program

- Delays in accessing Rx – lack capacity (inpatient/outpatient)
  - No support for the consequences of gene Xpert
- Still not enough MDR units for province
- Lack of adequate Medical staff in MDR care
- Contact & Defaulter tracing/Treatment support – not optimum
- No Plan for treatment failure – Sent Home
- Defaulters / Refusal of treatment
- Shortages or Erratic Supply of Drugs at time
- Side effects of medication
  - Cycloserine / Capreomycin / Renal / Deafness
- Poor side effect monitoring
  - QT prolongation/ Renal / Deafness
- Lack of support from Tertiary/Regional Hospital in managing MDR patients
  - Refusal to accept MDR patients for higher level of care (2nd class citizens)
- Difficulty rolling out Nurse initiated program
- Failure in some areas for District program to take on Decentralized care.
Department of Health

&

A Special Thanks to All the HCW who continue the fight against TB & HIV often at great risk to themselves.

Thank You! &

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