PREScribing Gentamicin in HepMA
Prescribing gentamicin in HEPMA

1. Before HEPMA:
   - Limitations
   - Datix report and audit

2. Impact of HEPMA on gentamicin prescribing:
   - Benefit of changes
   - What we did
   - Pilot of prescribing gentamicin in HEPMA
   - Datix - post HEPMA and staff feedback

3. Quality Improvement (QI) project on prescribing gentamicin in HEPMA

4. Further work
### Lothian gentamicin calculator/chart

**Before HEPMA**

#### Instructions:
1. Check patient's last dose date and adjust the dosage accordingly.
2. Use the chart to calculate the correct dosage.
3. Ensure patient is monitored closely for adverse reactions.

<table>
<thead>
<tr>
<th>Child Weight (Kg)</th>
<th>Gentamicin Dose (mg)</th>
<th>Gentamicin Level (mg/L)</th>
<th>Total Dose (mg)</th>
<th>Adjusted Dose (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>5</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td>10</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

*Note: Adjustments may be necessary based on renal function.*

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**Type of Drug:** Gentamicin

**Contraindications:**
- Hypersensitivity to aminoglycosides
- Renal impairment

**Adverse Effects:**
- Ototoxicity
- Nephrotoxicity

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**Additional Information:**
- Monitor urine output and renal function closely.
-Administer in a monitored environment.

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**Important Notes:**
- Adjustments may be necessary based on individual patient response.
- Regular laboratory monitoring is essential.

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**References:**
- Lothian Antimicrobial Stewardship Guidelines
- British Society for Antimicrobial Chemotherapy (BSAC) Guidelines

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**Contact:**
- Antimicrobial Stewardship Team
- Antimicrobial Prescribing Hotline (APH)
Before HEPMA: Prescribing gentamicin

- Gentamicin was on the paper medication chart (kardex) prescribed “as per chart” or “as charted”
- No dose, dosing interval or time of administration documented
## Type of error

<table>
<thead>
<tr>
<th>Error Description</th>
<th>Total number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing doses</td>
<td>23 (34%)</td>
</tr>
<tr>
<td>Wrong frequency</td>
<td>17 (25%)</td>
</tr>
<tr>
<td>Wrong information entered in calculator</td>
<td>17 (25%)</td>
</tr>
<tr>
<td>Incorrect administration</td>
<td>3</td>
</tr>
<tr>
<td>Missing levels</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
</tr>
</tbody>
</table>

**Gentamicin Datix before HEPMA**

Sept 2019 to Sept 2020
100 gentamicin charts were reviewed
Wards: colorectal, urology, general surgery and acute medicine
57% female, age range: 20 to 92 years old

<table>
<thead>
<tr>
<th>Gentamicin levels at the correct time</th>
<th>Frequency prescribed correctly</th>
<th>Renal function unchanged</th>
<th>Accuracy of the calculator predicted dosing interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>88%</td>
<td>91%</td>
<td>84%</td>
<td>78%</td>
</tr>
</tbody>
</table>
Impact of HEPMA on gentamicin prescribing
• Gentamicin is not only prescribed for adults for treatment of an infection
• Several protocols in different areas for gentamicin prescribing: synergistic, renal medicine, neonates and surgical prophylaxis
• All the above protocols do not have additional prescribing charts and doses/dosing intervals/times prescribed on the paper chart (kardex)
• “Placeholder” products can be added to HEPMA but could cause further confusion and errors
What we did

• Revised the look of the on-line calculator
  (calculator remained the same)
• Training materials: video presentation and cases
• Quick guide how to prescribe gentamicin in HEPMA
• Pilot prescribing gentamicin in HEPMA
• Monitoring Datix
• Staff feedback

Training for use of the pilot gentamicin calculator click here.
(15 minutes video)
What we changed

HEPMA Gentamicin dosing calculator and monitoring chart for adult patients

Use for patients aged 16 and over. THIS IS NOT A PRESCRIPTION. ALL PRESCRIBING AND ADMINISTRATION SHOULD BE RECORDED ON HEPMA.

Exclusions: Dialysis patients, synergistic use, prophylaxis unless 5mg/kg recommended.

Produced by NHS Lothian Antimicrobial Management Team antimicrobial.stewardship@nhslothian.scot.nhs.uk

<table>
<thead>
<tr>
<th>Enter details in the boxes below:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient name</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Patient ID</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Height (cm)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Weight (kg)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Creatinine (μmol/L)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>CrCl result (ml/min)</strong></td>
<td></td>
</tr>
</tbody>
</table>

Gentamicin dosing recommendations

<table>
<thead>
<tr>
<th>Gentamicin dose (mg)</th>
<th>Date and time:</th>
<th>Gentamicin dose (mg)</th>
<th>Date and time:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Predicted dosing interval, based on data entered

<table>
<thead>
<tr>
<th>Predicted dosing interval</th>
<th>Date and time:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HEPMA prescribing interval recommendation

<table>
<thead>
<tr>
<th>HEPMA prescribing interval recommendation</th>
<th>Date and time:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

Confirm dosing interval with levels

<table>
<thead>
<tr>
<th>Confirm dosing interval with levels</th>
<th>Date and time:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Recommended date and time first gentamicin level to be taken

<table>
<thead>
<tr>
<th>Recommended date and time first gentamicin level to be taken</th>
<th>Date and time:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pharmacy check

<table>
<thead>
<tr>
<th>Pharmacy check</th>
<th>Sign</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PREPARATION: Dilute dose in 200ml of sodium chloride 0.9% or glucose 5% and infuse over 30 minutes

PRESCRIBING GENTAMICIN IN HEPMA

CHOOSE: Gentamicin 30mg/2ml solution for injection (ampoule)

Prescribe the calculator recommended dose.

Frequency:
- XH24: if 24 hourly dosing recommended
- XH48: if 48 hourly dosing recommended
- STAT order: if not to give further dose until level ≤ 4 mg/L.

Administration record - complete each time gentamicin is given

<table>
<thead>
<tr>
<th>Date and time dose administered</th>
<th>Date and time level taken</th>
<th>Gentamicin level mg/L</th>
<th>Creatinine μmol/L</th>
<th>Does the dosing interval on HEPMA need to change?</th>
<th>Has the dosing interval been amended on HEPMA?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes / No</td>
<td>Yes, amended / No change required</td>
</tr>
<tr>
<td>Dose 1</td>
<td></td>
<td></td>
<td></td>
<td>Yes / No</td>
<td>Yes, amended / No change required</td>
</tr>
<tr>
<td>Dose 2</td>
<td></td>
<td></td>
<td></td>
<td>Yes / No</td>
<td>Yes, amended / No change required</td>
</tr>
<tr>
<td>Dose 3</td>
<td></td>
<td></td>
<td></td>
<td>Yes / No</td>
<td>Yes, amended / No change required</td>
</tr>
</tbody>
</table>

Step 1: Nursing staff document the gentamicin level and renal function and complete Step 2 before the next dose of gentamicin is due.

Step 2: Clinical team: Put the gentamicin level on the monitoring chart to confirm the dosing interval.

Nursing staff should NOT ADMINISTER the next dose of gentamicin if this section is not completed unless instructed to by clinical team. If not completed discuss with clinical team/NHS.

Step 3: Clinical team: If the gentamicin level is in the red zone, discuss with clinical team/NHS.

@72 hours review need for ongoing antibiotics - stop or justify continue. Document outcome of review using tantibreview.

Continued IV gentamicin is acceptable after 72 hours, for up to 9 days in total, where the patient is improving, oral route is not available, and there is no deterioration in renal function or hearing. Look at the Antimicrobial Comparator for IV to oral switch options.

<table>
<thead>
<tr>
<th>Dose 4</th>
<th>Dose 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Quick guide: how to prescribe gentamicin on HEPMA
Pilot of Prescribing gentamicin in HEPMA

From March 2021 to 31st May 2021
Pilot results

Total patients: 47
Wards: 6 surgical, 3 medical and 3 oncology wards

Use of the calculator

<table>
<thead>
<tr>
<th>Patients details entered correctly</th>
<th>Levels taken and recorded on chart</th>
<th>Dosing interval predicted by calculator confirmed with levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>74%</td>
<td>55%</td>
<td>86%</td>
</tr>
</tbody>
</table>
Pilot results

Prescribing gentamicin in HEPMA

<table>
<thead>
<tr>
<th>Right gentamicin product</th>
<th>Correct dose and rout prescribed</th>
<th>Right frequency prescribed</th>
<th>Gentamicin given within an hour of the prescription</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>91%</td>
<td>98%</td>
<td>91%</td>
</tr>
<tr>
<td></td>
<td>96%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Datix (March 2021 to Sept 2021)

Total Datix: 11

- 2 patients received two doses within 24 hours
- 1 patient transferred overnight from a non-HEPMA to HEPMA hospital - unclear documentation (A&E) on if gentamicin had been given
- 3 patients gentamicin levels were not taken
- 5 patients received 24 hourly dosing when it should have been 48 hourly
  - 2/5 wrong interval prescribed – calculator correct
  - 2/5 no levels taken before dose administered
  - 1/5 change to dose interval identified but not modified on HEPMA
What could be better?

“Location of the paper chart distant from the computer trolley “cows”

“Some Drs. were not aware of need to document on chart and HEPMA”

“New Drs. no access to printers”

Any suggestions for improvement?

“Reminders on HEPMA which patients are on gentamicin”

“White board on the treatment room and Drs room to list all the patients on gentamicin”
Staff feedback - Pharmacists

“alert that pops up on HEPMA to prompt the nurse to check the chart”

“Yes, I’d prefer dosing intervals over using the PRN”

“to have an extra function on HEPMA to block the administration prior to confirming that the level has been assessed by a prescriber – but it may lead to missed doses”

“Some levels are still not taken but this is not a new problem. Charts are not being completed regularly.”
What we did next

• The results of the pilot, Datix and staff feedback discussed at AMC

• Calculator/chart modified according to comments

• A “Dnote” added on HEPMA to remind Drs how to prescribe gentamicin, to print chart and check levels, and for nurses to check levels and chart before administration

• Drug & Therapeutic Committee approved continued use during the roll out of HEPMA in all acute sites

• D&T requested a quality improvement project to further support implementation in ward areas
PRESRICERS USING GENTAMICIN AS TREATMENT FOR ADULTS:

- Print the gentamicin chart. Note the exceptions to its use. Check the DISCONTINUED RX tab that gentamicin has not already been given.
- Prescribe the gentamicin dose & dosing interval on HEPMA.
- Check a gentamicin level after every dose. Review the levels & confirm the dosing interval on the paper gentamicin chart.

NURSING STAFF ADMINISTRATION GENTAMICIN:

- Document the time of each administration on the paper gentamicin chart & on HEPMA
- Only administer the next dose of gentamicin where the data/time is CONFIRMED on the paper gentamicin chart.
- Highlight to the clinical team immediately where the paper gentamicin chart has not been completed.
Quality improvement project

Colorectal and Acute Medicine wards
AIM

“To ensure that levels of gentamicin are taken at the right time after the first dose and if needed, dosing interval is adjusted on HEPMA before nurses administer the second dose”
QI: Prescribing gentamicin in HEPMA

Cause and Effect ("Fishbone") Diagram

- Staff
  - Nurse shortage
  - Ward Dxa new Dxa
  - Anesthetics not familiar with HEPMA

- Process
  - Dose has not changed on HEPMA after levels indicated to change
  - No information when transfer patient to different ward. Communication MDT on ward
  - Dose and dosing interval in HEPMA and chart not match
  - Dose given before taking levels

- Environment
  - Busy weekend
  - Communication on transfer and the MDT on the ward
  - Patient could type
  - 1-2 week after introducing HEPMA

- Equipment
  - Two systems: paper and electronic
  - New Dxa. Not access to a printer

- Patient
  - Missed doses
  - Double dose
  - Sometimes patient does not have cannula and delay levels and doses

Themes - Hepma Gentamicin datix
QI project: Measures

Identification of inpatients on gentamicin using a Logicity (HEPMA) report.

1-Was level taken at the right time after the first dose?

2-Was the date and time of the second dose confirmed on the gentamicin chart prior to administration?

3-Was the second dose administered at the right dosing interval?
## QI- Results

<table>
<thead>
<tr>
<th>Total patients on gentamicin</th>
<th>Levels taken at the right time</th>
<th>Dose confirmed on the chart</th>
<th>Patients that the dosing interval needed to change after the first dose</th>
<th>Second dose administered at the right dosing interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>74%</td>
<td>67%</td>
<td>30%</td>
<td>93%</td>
</tr>
</tbody>
</table>
QI Project: Run charts

Ward 72

Ward 24

Ward 23
QI: Prescribing gentamicin in HEPMA
Further work

- Develop a gentamicin QI project toolkit to embed gentamicin QI in the ward areas that use it the most. Work with the healthboard QI leads and local QI teams to prioritise it.

- Educational project. Aim: to ensure nurses understand the new gentamicin chart and process
  A short video will be produced to explain the new chart and process and the nurses will need to answer four scenarios after watching the video

- Repeat Audit in (medical and surgical) to evaluate the accuracy of the dosing interval predicted by the calculator when compare with the dosing interval based on gentamicin levels
Acknowledgements

Morgan Evans
Barbara Moore
Linda Robertson
Carol Philip
Alison Cockburn
Jin Werne Hah
Lesley Macher
Sandra Nash
Sheeba Zahir
Drs and nurses in colorectal ward at WGH for their feedback
Any Questions?