Malawi Telepathology

Helping children with cancer in Malawi by speedy diagnosis

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Newcastle upon Tyne Hospitals
NHS Foundation Trust
Malawi

- Population 13.6 million
- Resource challenged country
  - Healthcare workers/100,000: 57 (UK 1552)
  - Health budget/person/year £10 (UK £2000)
- Queen Elizabeth Central Hospital large government referral hospital – 28,000 children admitted per year
- 23 bedded paediatric oncology ward – 320 new patients per year
- Head of unit Professor Elizabeth Molyneux (Liz)
The 10 most common childhood cancers in Malawi

- 320 new patients per year

**Diagnosis**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burkitt lymphoma</td>
<td>46</td>
</tr>
<tr>
<td>Kaposi sarcoma</td>
<td>14</td>
</tr>
<tr>
<td>Retinoblastoma</td>
<td>9.9</td>
</tr>
<tr>
<td>Wilm’s tumour</td>
<td>6.3</td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td>3.9</td>
</tr>
<tr>
<td>Leukaemia (A.L.L.)</td>
<td>2.8</td>
</tr>
<tr>
<td>Non Hodgkin lymphoma</td>
<td>2.5</td>
</tr>
<tr>
<td>Rhabomyosarcoma</td>
<td>2.5</td>
</tr>
<tr>
<td>Osteosarcoma</td>
<td>1.7</td>
</tr>
<tr>
<td>Other sarcoma</td>
<td>1.5</td>
</tr>
</tbody>
</table>
The Challenge

• First world medicine offers highly intensive treatment with relatively good survival and high morbidity
• This requires an expensive infrastructure for intensive supportive care both in the hospital and out.
• Some childhood tumours (eg Burkitt, ALL) are very chemosensitive. Effective results can be achieved with pragmatic gentler treatment protocols with acceptable toxicity, which are deliverable in a resource limited setting

• Accurate, fast diagnosis is critical to patient and treatment selection
Simon Bailey; Liz Molyneux
ALL Induction

Patient Name
Date of Birth
Hospital Number

Full Blood count
Haemoglobin
White blood count
Neutrophils
Platelets

Treatment given

Bone marrow
1-2 years old - 8 mg
2-3 years old - 10 mg
3+ years old - 12 mg

Intrathecal methotrexate

Asparaginase 6000 IU/m² per dose (intramuscular)
Day 4 - 1st dose

Vincristine 1.5 mg/m² per dose

Prednisolone 40 mg/m²/day in 2 divided doses then wean over 5 days

Dose

Day 1 8 15 22
Week 2 3 4 5
Date

Malawi ALL 3
Sheet 2
Induction
# Blantyre Burkitt Protocol

<table>
<thead>
<tr>
<th>Drug</th>
<th>Days</th>
<th>Doses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclophosphamide</td>
<td>1</td>
<td>40 mg/kg (max 1.6g)</td>
</tr>
<tr>
<td>Doxorubicin</td>
<td>8</td>
<td>60 mg/m²</td>
</tr>
<tr>
<td>Prednisolone</td>
<td>15</td>
<td>60 mg/m² per day in 2 divided doses</td>
</tr>
<tr>
<td>Vincristine</td>
<td>28</td>
<td>1.5 mg/m² (max 2 mg)</td>
</tr>
<tr>
<td>IT methotrexate</td>
<td></td>
<td>0-1 year 6mg, 1-2 years 8 mg, 2-3 years 10 mg, 3+ years 12mg</td>
</tr>
<tr>
<td>IT hydrocortisone</td>
<td></td>
<td>12mg/dose</td>
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</tbody>
</table>

**Protocol:**

- **Doxorubicin** (Stage 3 and 4 only)
- **Prednisolone**
- **Vincristine**
- **IT MTX/HC**

**DAYS:**

- 1
- 8
- 15
- 28
New patient work up

• Clinical assessment (history, examination)
• Imaging (X ray, ultrasound, CT)
• Pathology tests
  – Blood count and film examination, biochemistry
  – Bone marrow aspirate
  – Fine needle aspirate
  – Biopsy

• Problem – local turnaround time for pathology reporting
Pathology Report for
Queen Elizabeth Hospital Malawi.

<table>
<thead>
<tr>
<th>Patients name.</th>
<th>Hospital No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (or Date of Birth).</td>
<td>Sex.</td>
</tr>
</tbody>
</table>

Date of Sample.

Type of Sample. FNA

Clinical History.

- Relapsed Burkitts - swollen left leg - FNA from leg

Slides.

![Slide Images]

Report.

Cellular FNA preps. Heavy monotonous infiltrate of malignant cells with appearances typical for Burkitt Lymphoma. Consistent with the clinical diagnosis of relapsed Burkitt Lymphoma.

Recommendation.

Suggested treatment with relapsed Burkitt lymphoma protocol

Reported by.                       Date.
Remote and rapid pathological diagnosis in a resource challenged unit

P Carey,1 R Fudzulani,2 D Scholfield,3 G Chagaluka,2 T Tomoka,4 G Liombe,4 K Banda,2 V Wadhera,5 S Samarasinghe,1 E M Molyneux,2 S Bailey6

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2Department of Paediatrics, Queen Elizabeth Hospital, Blantyre, Malawi
3Medical School, University of Birmingham, Birmingham, UK
4Department of Pathology, Queen Elizabeth Hospital, Blantyre, Malawi
5Department of Pathology, Great North Childrens Hospital, Newcastle upon Tyne, UK
6Department of Child Health, Great North Childrens Hospital, Newcastle upon Tyne, UK

Correspondence to

ABSTRACT
Malawi is one of the world’s poorest countries, but despite this, has a dedicated paediatric oncology service. The service has been hampered by the inability to make a timely cytological diagnosis in the majority of patients. A telemedicine programme was commenced to help overcome this problem, and the results for the first 197 consecutive patients are described. The results are compared with the local reports where available. Most samples were fine needle aspirates (104/197–53%), but others included bone marrow aspirates, peripheral blood films and other fluid collections. A diagnosis was arrived at in 52% of the samples; there were 46 discordant results, 38 were when one or other of the local or distant teams were unable to make a diagnosis, and

Internet access, a fundamental requirement for telemedicine has grown rapidly in Africa, including Malawi, over the past few decades, and now all 54 African countries have direct internet access in the major cities.3 There are many ways of using telepathology, ranging from complicated, remotely driven microscopes4 to simple e-mails of photographic images. It is important that the provision of telepathology services is driven by the need of the local centre, that appropriate clinical information is provided and that the results are interpreted for clinical use by the local clinician who understands the limitation of the diagnosis that such a system imposes. Such a system needs to be robust and deliverable; and the system needs to be established
Steve O’Brien; Mpathe webmaster!
MPathE website – referral homepage

Patient referral

This section should be filled in by the referring clinician. At the same time please upload into Dropbox any images that you want reviewed.

Dropbox link IMPORTANT! *

Person submitting form

- Select -

Patient information

Last name

First name

Gender

- Male
- Female

Date of birth

[dd-MM-yyyy]

If date of birth is not known, please give the estimated age:

Home town

Clinical summary

Please provide a short clinical summary

When did the patient first present?

[dd-MM-yyyy]

Specialist review

This section to be completed by pathology & haem onc.

Pathology reviewer

- Select -

Not registered?

Date of specialist review

[dd-MM-yyyy]

Review of pathological material

What did the pathological material show?

Please tick this box when pathology review completed.

Summary and recommended treatment

Add referring doctor

- Select -

Diagnosis

- Select -

Recommended treatment

Please tick this box when clinical review completed.

Follow up

What treatment was given?

Please tick this box when clinical review completed.
<table>
<thead>
<tr>
<th>#</th>
<th>Last name</th>
<th>First name</th>
<th>Referring clinician</th>
<th>Provisional diagnosis</th>
<th>Added Time</th>
<th>Dropbox link IMPORTANT!</th>
<th>Please tick this box when clinical review complete</th>
<th>Add referring clinician</th>
</tr>
</thead>
<tbody>
<tr>
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<td>false</td>
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</tr>
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* All times are in GMT
Dropbox link to pictures
Working image screen
Patient referral

This section should be filled in by the referring clinician.
AT THE SAME TIME PLEASE UPLOAD INTO DROPBOX ANY IMAGES THAT YOU WANT REVIEWED.

Dropbox link IMPORTANT!

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First name

Gender

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 Female

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[dd-MMM-yyyy]

if date of birth is not known, please give the estimated age:

(estimated age)

Home town

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Summary and recommended treatment

Add referring doctor

[Select...]

Diagnosis

[Select...]

Recommended treatment

[Select...]

☐ Please tick this box when clinical review complete
Advantages/Limitations

- **Advantages**
  - Speed
  - Access to expertise

- **Limitations**
  - Only feasible to capture limited representative photographed ‘fields’
  - A ‘non-expert’ is choosing the captured fields
  - Single modality (morphology) diagnosis (no immunolophenotype/cytogenetic/molecular triangulation)
  - ‘no diagnosis possible’ accounts for a large proportion of coding categorisation
Governance/Accountability/Liability

• Quality control only possible in retrospect
  – Correlation with local pathology diagnosis
  – Cross check against transported slides (UK)
• Not a comprehensive integrated diagnostic pathology report
  – Rather a pragmatic morphology-only opinion triangulated just by clinical correlation
  – Enhanced by further expert clinical overview (SB)
• Clinical team aware of the pragmatic caveats/limitations
Potential next steps

• New sites – expand/share website format, recruit more reporters
  – Governance issues as becomes more ‘formalised’

• Slide scanning
  – Scanner cost
  – Data file size

• DNA analysis
  – Easy to post
  – ?future substitute for immunophenotype/cytogenetics
2013 in Malawi....

Happy Christmas to you all and a huge thank you once again for all the wonderful support that you have given to the children in Malawi in 2013. Professor Malunga and her team have been able to treat children more effectively. The country’s first neurosurgeon has started operating on children using a microscope donated by the British charity. The funds will also help enormously and the start of being able to treat some children with brain tumours.

This year, a number of exciting developments have taken place. As you know from our previous newsletters, a new protocol to treat children with acute leukaemia was developed last year and a trial began. With the protocol in place, a researcher from CIMA has now opened which will hopefully give the children better chance of cure. This has provided different chemotherapy drugs, which we have been involved in

A package of toys, games, clothes, shoes and boots have been sent out to children in Malawi for Christmas. The children love them when opening the gifts are wonderful for cancer.

Once again, a very big thank you for all your generosity in ensuring the children with cancer in Malawi can able to be treated.

A Blessed Christmas to you all. Zikomo Nduthi.

The Children with Cancer in Malawi Trustees