ANATOMY OF A TELEHEALTHCARE PROJECT WITH POINT-OF-CARE TESTING FOR MONITORING CHEMOTHERAPY: from concept to adoption

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Structure of the Talk: the project

- Clinical problem....the unmet need
- Background knowledge
- Hypothesis....the proposition
- Concept....potential solution
- Care pathway: definition and (re)modelling
- Meeting the need: the evidence portfolio
- Adoption: the challenges
Key Findings from NCEPOD Report
47050 patients receiving SACT

• ~2%; died within 30 days of their last SACT (n=1044)

• 27%; chemotherapy caused or hastened death (115/429)

• 14%; essential pre-treatment investigations missed (64/461)

• 18%; results unacceptable for full dose SACT(79/434)

• ~80%; failure to act on unacceptable investigations in (65/77)

• 32%; most recent blood count >72 hours (120/379)

National Confidential Enquiry into Patient Outcome and Death 2008
### Clinical Problem

**incidence of adverse events**

<table>
<thead>
<tr>
<th>Adverse event</th>
<th>Frequency hospitalised (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever or infection</td>
<td>8.4</td>
</tr>
<tr>
<td>Neutro- or thrombocyto-penia</td>
<td>5.5</td>
</tr>
<tr>
<td>Dehydration or electrolyte disorders</td>
<td>2.5</td>
</tr>
<tr>
<td>Nausea, emesis or diarrhea</td>
<td>2.4</td>
</tr>
<tr>
<td>Anemia</td>
<td>2.2</td>
</tr>
<tr>
<td>Constitutional symptoms</td>
<td>2.0</td>
</tr>
<tr>
<td>Deep vein thrombosis or pulmonary embolus</td>
<td>1.2</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>0.9</td>
</tr>
</tbody>
</table>

Hassett et al 2006
Clinical Problem
chemotherapy insights

Scheduling
- missed clinics (20% of patients)
- mortality issues
- wasted hospital/ clinic resource

Adverse events
- emergency hospitalisations (5%)
- lengthy bed stays (10-20 days)
- significant mortality (10%)

Patients
- over-treated (20%)
- under-treated (~50%)
Impact of Sub-Optimal Chemotherapy dose calculation, delay, or reduction

Impact of Chemotherapy Dose Intensity on Cancer Patient Outcomes
Guy H. Lyman, MD, MPH, FRCP (Edin), Durham, North Carolina

Myelosuppression
- No (n = 257)
- Yes (n = 227)

Proportion Alive
P = .006 (log rank)

Full-Dose Chemotherapy on Schedule Increases the Likelihood of Survival in Breast Cancer

Optimal dose (%)
- ≥ 85 (n = 42)
- 65-84 (n = 94)
- < 65 (n = 71)
- Control (n = 179)

Probability of overall survival

Time after mastectomy (years)


The Chemotherapy Care Pathway
where monitoring fits into the pathway

Step 1  Access and referral to an oncologist
Step 2  Assessment and decision to treat, patient consent
Step 3  Prescribing first cycle
Step 4  Dispensing
Step 5  Delivery and treatment environment
Step 6  Patient and carer information, education, support and advice
Step 7  Urgent assessment and management of complications
Step 8  Prescribing subsequent cycles
Step 9  End of treatment record and subsequent care plan
Home Clinical Monitoring

Concept

- Neutropenia and increasing risk of infection and sepsis
- Sub-optimal dosing?
- Optimal status

Graph showing white cell count over days from 0 to 6000, with days labeled from 1 to 21.
Monitoring Chemotherapy technology configuration
Remote Patient Monitoring
patient and oncologist connected

Patient tests

Patient views

Connectivity
Clinical decision support

Oncologist views

Oncologist advises

See doctor
Call doctor
All OK
Innovation in Health Care
barriers to technology adoption

Budget silos
Prioritisation
Reimbursement
Decommissioning
Innovation Culture
Evidence
Communication
Decision making processes
Implementation planning

NHS Institute for Innovation and Improvement 2009
Home Chemotherapy Monitoring
evidence requirements

HEALTH NEED

DECIDE

Impact on:
- cost

Impact on:
- process outcome

Impact on:
- diagnosis
  - therapy
  - clinical outcome

Diagnostic performance

Technical performance

Technical performance

Diagnostic performance

Impact on:
- clinical outcome
  - therapy
  - diagnosis

Impact on:
- process outcome
  - progress

Impact on:
- cost

Impact on:
- outcome
  - process

Impact on:
- need
  - home chemotherapy monitoring

Evidence requirements

Technical performance

Diagnostic performance

Impact on:
- outcome
  - process

Impact on:
- need
  - home chemotherapy monitoring

Evidence requirements

Technical performance

Diagnostic performance

Impact on:
- outcome
  - process

Impact on:
- need
  - home chemotherapy monitoring
Outline of Study Programme

key research questions: short term

Technical performance
- is the system accurate and precise in the laboratory?

Diagnostic accuracy
- is the system accurate and precise in the patient’s home?
- will testing in the home predict adverse reductions in the WCC?

Impact on process
- does testing in the home reduce wasted chemotherapy sessions?

Impact on adverse events
- does monitoring reduce emergency admission with febrile neutropenia?
- does monitoring reduce hospitalisation with neutropenia?
Outline of Study Programme

key research questions: long term

Personalised therapy
- does monitoring reduce dose delay?
- does monitoring reduce dose reduction?
- does monitoring enable better RDI?

Clinical outcomes
- does monitoring improve cancer mortality

Patient and carer experience
- does monitoring improve the process of care for patient and carer?
Outline of Study Programme

key research questions: adoption

Economic outcomes
- is monitoring cost effective?

Commissioning
- key stakeholders

Transformational change
- can monitoring at home be established in routine clinical practice?

PATIENT

Commissioner

Home

Health Centre

Hospital
Patients with breast cancer

No monitor

Dose delay
- No neutropenia
- Hospital
  - Oncology ward
  - Intensive care

Monitor (all)

Dose delay
- No neutropenia
- Hospital
  - Oncology ward
  - Intensive care

£1200
£5036
£14953
£0
£1300
£1300
£1100

p=0.220
p=0.124
p=0.056
Home Monitoring of Chemotherapy challenges to adoption

- Clinical need established
- Technical performance demonstrated
- Care pathway modelled
- Clinical actions to be tested
- Resource reallocation to be agreed
- Implementation and audit