Innovations in Lung Cancer

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Why Do We Need Innovation?

![Bar chart showing number of deaths by disease category]

- Lung cancer
- Breast cancer
- Bowel cancer
- Other cancer
- Heart disease
- Lung disease
- Liver disease
- Stroke
- Injury
- Other

Number of deaths

Disease category

Slide Courtesy of Phil Crosbie
Public Health England

http://healthierlives.phe.org.uk/topic/mortality
THE CANCER REFERRAL TARGET

MAXIMUM TIME FROM GP URGENT SUSPECTED CANCER REFERRAL TO TREATMENT

GP REFERRAL → FIRST SEEN BY A SPECIALIST → DECISION TO TREAT MADE → FIRST TREATMENT

TARGET 14 DAYS MAX

TARGET 31 DAYS MAX
Poor Outcomes
- Poor Patient Experience
- Variable Staging
- Variable Assessment
- Variable Resection Rates

- Late Stage
- Variability of Clinical Pathways
- No Primary Prevention
- Delayed Pathways

Variable Evaluation of Patients
3 Major Innovations Changing the Landscape

• Tobacco Addiction
• Earlier Diagnosis
• Accelerated Pathways

“Innovation is crucial to the continuing success of any initiative”
Tobacco Addiction
• **14750 admissions from 146 hospitals**
• 73% had smoking status documented
• 28% smokers asked if they want to stop
• 6% of smokers referred to smoking cessation services
• 4% of smokers prescribed Nicotine replacement therapy
• Virtually 0% prescribed Varenicline (Champix)
• 51 of hospitals have a smoking cessation practitioner
• 23% of hospitals able to prescribe pharmacotherapy for tobacco addiction
• 26% of hospitals have a consultant lead for smoking cessation
• 44% of hospitals offer training to frontline staff
The culture change........

• Tobacco addiction is a disease
• Every patient deserves access to the most effective treatment
• Every health care professional requires the confidence and the competence to treat tobacco addiction
• Tobacco addiction is no different to treatment of alcohol addiction, MRSA screening & thromboprophylaxis
• Effective treatment of tobacco addiction brings immediate and substantial benefits to the NHS
• Hospitals must become institutes of health care promotion

Courtesy of Dr Matt Evison
**Conversation**
The right conversation every time

**Understand**
Understand the level of addiction

**Replace**
Replace nicotine to prevent withdrawal

**Experts and Evidence-based treatments**
Access to experts & the best evidence-based treatments

Courtesy of Dr Matt Evison
Initial Successes

1943 SMOKERS Admitted to Wythenshawe

- 95% Provided brief advice & initial interventions by admitting nurse
- 46% Prescribed NRT by admitting team
- 52% Accepted support by specialist team
- 10% Smokers prescribed varenicline as an inpatient
- 539 CURE team have provided 539 medication changes/additions

QUIT RATES:
- 20% Follow-up completion rate
- 4 weeks: 47%
- 12 weeks: 74%

Outcomes: 5 Months of CURE at Wythenshawe Hospital

Courtesy of Dr Matt Evison
Lung Cancer Screening
National Lung Screening Trial (NLST)
• 53,454 participants,
• Age 55-74, >30 packyears, smoked within 15 years
• Randomised to 3 annual low dose CT vs. CXR screening rounds.

Outcome
• 20% reduction in lung cancer specific mortality with LDCT
• 6.7% reduction overall mortality
• High FP – 96%
Cumulative lung cancer deaths (Men only)

Control arm:
214 lung cancer deaths

Screen arm:
157 lung cancer deaths

<table>
<thead>
<tr>
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<th>Year 8</th>
<th>Year 9</th>
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<tr>
<td>MALES</td>
<td>0.75</td>
<td>0.76</td>
<td>0.74</td>
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<tr>
<td></td>
<td>(P=0.015, 0.59-0.95)</td>
<td>(P=0.012, 0.60-0.95)</td>
<td>(P=0.003, 0.50-0.91)</td>
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<td>FEMALES</td>
<td>0.39</td>
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<td>(P=0.003, 0.18-0.78)</td>
<td>(P=0.009, 0.25-0.84)</td>
<td>(P=0.004, 0.35-1.04)</td>
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</table>
Manchester Lung Screening Pilot

Design
- Community-based (supermarket car parks)
  - Travel most common reason non-participation
- Located in deprived areas
  - North, Central and South CCGs
- Targeted at those most at risk
  - 6-yr lung cancer risk score >1.5% (PLCO\textsubscript{m2012})
- Immediate access to CT (mobile)
- 14 GP practices in total
- Invite sent to all aged 55-74
  - n = 16,402
  - Est. 60.5% ever smokers (n= 9,926)
- Lung Health Check / lung MOT

Lung Health Check
- Respiratory nurses (20 mins)
- Capacity for 2,800 LHC
- Respiratory symptoms
- Lung Cancer risk
- Simple spirometry / oxygen saturation
- BMI (height + weight)
- Consents
  - Research database (99.5%)
  - Data sharing
- Stop smoking advice
  - Non-judgemental
Bespoke LHC Clinic & ULDCT Uni

- Reception Area
- Assessment Area
- x3 OPC rooms
- Research Rooms
- Smoking Cessation Counsellor x2
- Patient Lifts/ Disabled Access
- Staff Room with toilets
- Security Package inc CCTV
- Built in, hidden cabling
- Near patient operation of CT, facilitating patient interaction
### Manchester Lung Trial – ‘Extraordinary Performance’ (D Aberle, WCLC 2018)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Manchester</th>
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<tr>
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<td>Baseline</td>
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<tr>
<td>Number of enrollees</td>
<td>1384</td>
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<tr>
<td>Indeterminate screens</td>
<td>176 (12.7%)</td>
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<tr>
<td>Positive Screens</td>
<td>65 (4.7%)</td>
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<tr>
<td>Cancers (% screened)</td>
<td>42¹,² (3%)</td>
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<tr>
<td>Stage I-II (% cancers)</td>
<td>33 (79%)</td>
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<tr>
<td>Interval cancers</td>
<td>0</td>
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<tr>
<td>False Positive Rate</td>
<td>39 (2.8%)</td>
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</table>

33% at unrecognised >10% risk of cardiovascular disease over 10 years (NNT=30)

10% unrecognised symptomatic airflow limitation (increased risk of death)

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Crosbie P et al Thorax 2018
Crosbie P et al Thorax 2018
Lung cancer: stage at diagnosis

- 79% early stage disease
- Almost 5 fold reduction in stage 4 disease
- 90% able to be offered curative intent treatment
- One lung cancer for every scanning day
Cumulative results (12-months)

- Lung cancer detection rate 4.4%
- (65 lung cancers in 61 individuals)
- Screening adherence good: >90%

- 1 cancer detected for every 23 people screened
- 80% early stage (I+II)
- 89% received curative intended treatment

- False positive rate 3.5%
- Benign surgical resection rate 2.5% (one case)
- Sensitivity 89.5%; specificity 97.1%
Ultra-Low Dose CT Further Mitigates Radiation Risk

Dose reduction technologies:
Examples spectral shaping

Radiation dose is now comparable to chest x-ray or long-distance flight

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<tr>
<th>Author / year</th>
<th>n</th>
<th>Effective dose</th>
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<tr>
<td>Fujita 2017</td>
<td>69</td>
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<tr>
<td>Gordin 2014</td>
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<td>Haubenreisser 2015</td>
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<td>Huber 2016</td>
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<tr>
<td>Messerli 2016</td>
<td>202</td>
<td>0.13</td>
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<td>Messerli 2017</td>
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<td>0.14</td>
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<tr>
<td>Sui 2015</td>
<td>84</td>
<td>0.13</td>
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<tr>
<td>Vardhanabuti 2017</td>
<td>98</td>
<td>0.14</td>
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Accelerated Pathways
Given Your GP Wondered About Possibility of Cancer, How Long Would You Expect to Wait to Complete Investigations?
Stage shift
- pre operative CT done as ‘needs up to date imaging pre operatively’

SEPTEMBER 2017

JANUARY 2018

18mm T1b grown to 25mm T1c
Can Delay Change Stage?

‘Millimetres Matter’
Stage Migration Is Likely With Current Cancer Waiting Times,
Eliminating Delay & Improving Outcomes

Immediate EBUS-TBNA (following baseline CT suggestive of stage I-III cancer) associated with
- shorter time to decision to treat
- Reduced number of unnecessary thoracotomy
- Increased survival (HR 0.6, p=0.0382)

Stage Change Seen in 35% (TNM 7)

26% changed 1 stage
7.5% changed 2 stages
1.5% changed 3 stages

Surgical Treatment
Delay in Stage I-II

Significant Reduction in 3-Year Survival

N=693,554 patients stage I-III disease 2003-2011
43% of patients started treatment after 4 wks,
& 25% greater than 6 wks
Median time to treatment was 24 days (IQR 7-44 days)
Overall Survival of Clinical Stage 1A Squamous Cell Carcinoma undergoing Lobectomy

If HR is 1.17 at 70 days, assume 98% survival for group with immediate surgery, then survival for delayed surgical group is (98/1.17) = 83.8%

So a survival difference of 14.2%, or 1.42% per week
Consequences of Delay

Physical Harm
Psychological Harm
Limited Diagnostic Capacity
Tumour Growth
Stage Migration
Poor Outcomes
Imaging
Physiology
Biopsy

Leicester 5th October 2018
Front end of the pathway:  
Referral to CT & OPA

Pre-RAPID:
- 27% patients had a CT scan within 7 days of referral
- 74% patients had a CT scan within 14 days of referral
- Patients waited an average of 6 days from CT scan to OPA
- 24% of patients had an OPA within 7 days of referral
- 84% of patients had an OPA within 14 days of referral
RAPID pathway

2WW GP Referral
CXR upgrade

- Patient contacted by phone and asked to attend radiology department at 8am

8am CT scan following day

- Point of care eGFR testing
- Real-time radiology vetting and ‘on-table’ review
- Hot reporting 9-10am

Chest physician review 10-11am

- CT scan results
- Diagnostic bundles
- Prehabilitation
Triage Outcome

- 44% of GP referrals could be discharged without review or redirected to general clinic, and reassured no cancer present (same-day)
- 26% of GP referrals were redirected to more appropriate clinics, including straight to bronchoscopy (haemoptysis/normal CT), or deferred clinic appointment for nodule surveillance
- Only 30% of GP 2ww referrals required evaluation in a dedicated lung cancer clinic
same day biopsy

- Preliminary report of metastatic NSCLC given 24 hours later

- TTF +ve lung adenocarcinoma
Introduction of RAPID programme

Special Cause Variation (Run length = 8)
2ww Referral to CT Scan

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<th>PreRAPID</th>
<th>PostRAPID</th>
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<td>CT Scan within 4 days</td>
<td>0</td>
<td>78.30%</td>
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<tr>
<td>CT scan within 7 days</td>
<td>27%</td>
<td>92.40%</td>
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<tr>
<td>CT scan within 14 days</td>
<td>74%</td>
<td>99.20%</td>
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Patient Aware of 'No Cancer' (median number of days)

Pre-RAPID: 6 days
Post-RAPID: 0 days

2ww Referral to OPC

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<tr>
<th></th>
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<th>Post-RAPID</th>
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<tr>
<td>&lt;7 days</td>
<td>24%</td>
<td>87%</td>
</tr>
<tr>
<td>&lt;14 days</td>
<td>84%</td>
<td>99%</td>
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<tr>
<td>&lt;21 days</td>
<td>99%</td>
<td>100%</td>
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2ww Referral to MDT

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<tr>
<th></th>
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<th>Post-RAPID</th>
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<tr>
<td>&lt;7 days</td>
<td>0%</td>
<td>8%</td>
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<tr>
<td>&lt;14 days</td>
<td>8%</td>
<td>42%</td>
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<tr>
<td>&lt;21 days</td>
<td>17%</td>
<td>77%</td>
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<tr>
<td>&lt;28 days</td>
<td>46%</td>
<td>90%</td>
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Leicester 5th October 2018
Better Outcomes
Best Patient Experience
Accurate Staging
Consistent Assessment
High Resection Rates

Earlier Stage
Standard Clinical Pathways
Tobacco Addiction
Short Pathways
Consistent Evaluation of Patients