Overview of Lung Cancer Early Diagnosis in the UK

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Conflicts of interest

• Educational grant to run Cambridge Chest Meeting 2015 from Agfa, Boehringer Ingelheim, Irwin Mitchell and Roche
• Travel support from Oncimmune Ltd
Smoking Prevalence and lung cancer: 1948-2012

Data from CRUK; slide for CRUK website
Risk of Lung Cancer in Women
Excess risk risk from tobacco

Effect of stopping smoking on cumulative risk of death by age 75 in men

European Age-Standardised Incidence Rates
Great Britain, 1993-2012

Data from CRUK
Annual incidence in the UK

- Male to female ratio <12:10
- In 1975 was 39:10

Data from National Registries from the 4 UK countries
Variation in incidence

90.3
Liverpool (PCT)

47.7
National Average
Mortality from common cancers 2012

Data from CRUK
SES and Risk of Lung Cancer
12074 patients

Hazard Ratio

Townsend Deprivation Quintile

THIN dataset

Cigarette Smoking Prevalence by Area Deprivation: 2012

Data from CRUK
### Lung Cancer in Males and Females in the UK

<table>
<thead>
<tr>
<th>Females (46%)</th>
<th>Males (54%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median age</strong></td>
<td>72</td>
</tr>
<tr>
<td>PS 0–1</td>
<td>47%</td>
</tr>
<tr>
<td>Stage I–II</td>
<td>25%</td>
</tr>
<tr>
<td>Anticancer treatment</td>
<td>57%</td>
</tr>
<tr>
<td>Surgery</td>
<td>16%</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>29%</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>26%</td>
</tr>
</tbody>
</table>

Source: National Lung Cancer Audit 2015 report
LUNG CANCER SURVIVAL BY STAGE OF DIAGNOSIS

= People surviving their lung cancer for five or more years

DIAGNOSED EARLIER
AT STAGE I

MORE THAN 3 IN 10

DIAGNOSED LATER
AT STAGE IV

LESS THAN 1 IN 10

Data for patients diagnosed in the East of England between 2003 and 2006

LET'S BEAT CANCER SOONER.
cr.uk.org
<table>
<thead>
<tr>
<th>Ed.</th>
<th>Events / N</th>
<th>MST</th>
<th>24 Month</th>
<th>60 Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA</td>
<td>1119 / 6303</td>
<td>NR</td>
<td>93%</td>
<td>82%</td>
</tr>
<tr>
<td>IB</td>
<td>768 / 2492</td>
<td>NR</td>
<td>85%</td>
<td>66%</td>
</tr>
<tr>
<td>IIA</td>
<td>424 / 1008</td>
<td>66.0</td>
<td>74%</td>
<td>52%</td>
</tr>
<tr>
<td>IIB</td>
<td>382 / 824</td>
<td>49.0</td>
<td>64%</td>
<td>47%</td>
</tr>
<tr>
<td>IIIA</td>
<td>2139 / 3344</td>
<td>29.0</td>
<td>55%</td>
<td>36%</td>
</tr>
<tr>
<td>IIIB</td>
<td>2101 / 2624</td>
<td>14.1</td>
<td>34%</td>
<td>19%</td>
</tr>
<tr>
<td>IV</td>
<td>664 / 882</td>
<td>8.8</td>
<td>17%</td>
<td>6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed Ed.</th>
<th>Events / N</th>
<th>MST</th>
<th>24 Month</th>
<th>60 Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>IA1</td>
<td>68 / 781</td>
<td>NR</td>
<td>97%</td>
<td>92%</td>
</tr>
<tr>
<td>IA2</td>
<td>505 / 3105</td>
<td>NR</td>
<td>94%</td>
<td>83%</td>
</tr>
<tr>
<td>IA3</td>
<td>546 / 2417</td>
<td>NR</td>
<td>90%</td>
<td>77%</td>
</tr>
<tr>
<td>IB</td>
<td>560 / 1928</td>
<td>NR</td>
<td>87%</td>
<td>68%</td>
</tr>
<tr>
<td>IIA</td>
<td>215 / 585</td>
<td>NR</td>
<td>79%</td>
<td>60%</td>
</tr>
<tr>
<td>IIIB</td>
<td>605 / 1453</td>
<td>66.0</td>
<td>72%</td>
<td>53%</td>
</tr>
<tr>
<td>IIIA</td>
<td>2052 / 3200</td>
<td>29.3</td>
<td>55%</td>
<td>36%</td>
</tr>
<tr>
<td>IIIB</td>
<td>1551 / 2140</td>
<td>19.0</td>
<td>44%</td>
<td>26%</td>
</tr>
<tr>
<td>IIIC</td>
<td>831 / 986</td>
<td>12.6</td>
<td>24%</td>
<td>13%</td>
</tr>
<tr>
<td>IVA</td>
<td>336 / 484</td>
<td>11.5</td>
<td>23%</td>
<td>10%</td>
</tr>
<tr>
<td>IVB</td>
<td>328 / 398</td>
<td>6.0</td>
<td>10%</td>
<td>0%</td>
</tr>
</tbody>
</table>
Stage at Presentation

Data from National Lung Cancer Audit
HOW AND WHEN LUNG CANCER PATIENTS ARE DIAGNOSED

% OF PATIENTS DIAGNOSED

- By urgent GP two week wait referral for suspected cancer symptoms: 28%
- By routine GP referral: 21%
- In an emergency, via emergency GP transfer to hospital, as a hospital patient, or via A&E: 35%
- Hospital in or outpatient: 13%
- Unknown data: 3%

STAGE WHEN DIAGNOSED

- Early (Stage I): 17%
- Late (Stage IV): 47%
- Early (Stage I): 8%
- Late (Stage IV): 72%
- Early (Stage I): 24%
- Late (Stage IV): 43%

Source: National Cancer Intelligence Network, data for England 2012–2013

LET'S BEAT CANCER SOONER.
cruk.org
NCIN Routes to Diagnosis

- Emergency: 35
- GP / 2WW: 49
- Other OP: 13
- Other: 3
1 year survival (%)
International comparison of relative survival

Coleman et al Lancet 2011; 377: 127–38
Excess Early Mortality from Lung cancer

Holmberg et al. Thorax, 2010;65:436-441
Age-standardised 1-year net survival from non-small cell lung cancer by stage at diagnosis

Importance of Early Diagnosis

• More treatment with curative intent
  – Earlier stage

• Fewer emergency presentations
  – Problem recognised before a crisis

• Better performance status
  – More active treatment
Performance Status

Source: NLCA 2005-8
PS and overall survival
NLCA linked to HES

<table>
<thead>
<tr>
<th>PS</th>
<th>Total</th>
<th>Died</th>
<th>%</th>
<th>HR</th>
<th>Adj HR*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5839</td>
<td>3804</td>
<td>64</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9267</td>
<td>7226</td>
<td>78</td>
<td>1.49 (1.43 to 1.55)</td>
<td>1.28 (1.22 to 1.33)</td>
</tr>
<tr>
<td>2</td>
<td>5300</td>
<td>4737</td>
<td>89</td>
<td>2.50 (2.40 to 2.61)</td>
<td>1.87 (1.76 to 1.99)</td>
</tr>
<tr>
<td>3</td>
<td>3230</td>
<td>3103</td>
<td>96</td>
<td>4.51 (4.30 to 4.74)</td>
<td>3.12 (2.91 to 3.35)</td>
</tr>
<tr>
<td>4</td>
<td>737</td>
<td>722</td>
<td>98</td>
<td>7.62 (7.03 to 8.25)</td>
<td>5.21 (4.39 to 6.17)</td>
</tr>
<tr>
<td>Missing</td>
<td>9992</td>
<td>8168</td>
<td>82</td>
<td>1.82 (1.75 to 1.89)</td>
<td>1.54 (1.45 to 1.62)</td>
</tr>
</tbody>
</table>

* Adjusted for age, sex, ethnicity, deprivation, comorbidity, stage, surgical centre, radiotherapy centre and trial entry centre

Lung Cancer symptoms at referral

<table>
<thead>
<tr>
<th></th>
<th>No malignant</th>
<th>Percent</th>
<th>No benign</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No patients</td>
<td>650</td>
<td></td>
<td>392</td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>266</td>
<td>41</td>
<td>255</td>
<td>65</td>
</tr>
<tr>
<td>Dyspnoea</td>
<td>355</td>
<td>55</td>
<td>153</td>
<td>39</td>
</tr>
<tr>
<td>Weight loss</td>
<td>308</td>
<td>47</td>
<td>100</td>
<td>26</td>
</tr>
<tr>
<td>Haemoptysis</td>
<td>140</td>
<td>22</td>
<td>119</td>
<td>30</td>
</tr>
<tr>
<td>Chest pain</td>
<td>256</td>
<td>39</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>

Factors contributing to poor outcomes

High incidence

Non-specific symptoms

Late recognition

Unfavourable socio-demographics

Non use of risk factors

Late presentation

Poor targeting of CXR

Early death

No direct access CT

Late suspected diagnosis

Variable access to treatment and according to where first referred

High rate of emergency admissions

Complex diagnosis, staging and fitness work up

Variable access to expertise

Wide variation in treatment and outcomes, worse than other countries

Poor compliance with targets

Highest mortality of all cancers, suboptimal improvement
Be Clear on Cancer National Campaign
May to July 2012

- Estimated 700 additional cancers diagnosed, compared to the same period in the previous year.
- Approximately 400 more people diagnosed at an earlier stage (23.4% to 26.1%)
- Around 300 additional patients had surgery (13.6% to 16%)
## Quantifying risk

<table>
<thead>
<tr>
<th>First author</th>
<th>Database</th>
<th>Cases</th>
<th>Dates</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hippisley-Cox 2011</td>
<td>EMIS/Qresearch</td>
<td>3785</td>
<td>2000-2010</td>
<td>National</td>
</tr>
<tr>
<td>Iyen-Omofoman 2013</td>
<td>THIN</td>
<td>12074</td>
<td>2000-2009</td>
<td>National</td>
</tr>
</tbody>
</table>
## Low-dose CT trials reporting effects on lung cancer mortality

<table>
<thead>
<tr>
<th>Trial</th>
<th>Number in study/control</th>
<th>Screening rounds</th>
<th>Average FU (years)</th>
<th>Intervention regimen</th>
<th>Control regimen</th>
<th>RR (95% CI) LC mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>DLCST</td>
<td>2052/2052</td>
<td>5</td>
<td>5</td>
<td>Annual CT</td>
<td>Usual care</td>
<td>1.03 (0.66-1.66)</td>
</tr>
<tr>
<td>DANTE</td>
<td>1276/1196</td>
<td>5</td>
<td>8.3</td>
<td>Annual CT</td>
<td>Baseline chest X-ray</td>
<td>0.99 (0.69-1.43)</td>
</tr>
<tr>
<td>NLST</td>
<td>26722/26732</td>
<td>3</td>
<td>6.2</td>
<td>Annual CT</td>
<td>Annual chest X-ray</td>
<td>0.80 (0.73-0.93)</td>
</tr>
<tr>
<td>MILD</td>
<td>2376/1723</td>
<td>5 annual or 3 biennial</td>
<td>4.4</td>
<td>Annual or biennial CT plus smoking cessation advice and spirometry</td>
<td>Smoking cessation advice, spirometry</td>
<td>1.50 (0.62-3.60)*</td>
</tr>
</tbody>
</table>

**Combined lung cancer mortality result**

0.81 (0.70-0.92)
Methods

• Awareness and action
• Engagement – with hard to access groups
• Recognition and referral – risk assessment
• Screening for high risk but what about the rest?
• Holy Grail of inexpensive, accurate blood, urine or breath test

• Integrate with prevention and multiple health intervention
• Supported by pathways and technology
CRUK ED Workshop

- Broad spectrum of research represented
- Multidisciplinary group
- Review existing research
  - Results
  - On-going studies
- Interact, expand networks and form new collaborations
- NCRI Screening Prevention and Early Diagnosis advisory group (SPED)