Quality assurance, centralisation and outcomes in complex cancer surgery

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Specialised Commissioning Internal Medicine Programme of Care, NHS England
NICE Colorectal Cancer Guideline Development Group
NICE Colorectal Cancer Quality Standards Development Group

Aintree University Hospitals
Disclosures

• Advisory Boards
  - Merck Serono
  - Sanofi Aventis
  - BTG Biocompatibles
  - Bayer

• Speaker Panel
  - Merck Serono
  - Sanofi Aventis
  - BTG Biocompatibles
Drivers for improvement

• Our populations are getting older:
  - age is the greatest aetiological factor for disease in western society
• Healthcare inflation is 5% per year
• Patient expectation increases year on year
• Loss of medical manpower:
  - are we producing enough doctors?
  - impact of EWTD?
• Can we afford it?
The surgeon as a prognostic factor in rectal cancer: variability among 13 consultant surgeons

- Curative resection (R0): 40 – 76%
- Anastomotic leakage: 0 – 25%
- Postoperative mortality: 8 – 30%
- Local recurrence: 0 – 21%
- 5 year survival: 20 – 63%

McArdle and Hole, BMJ 1991;302:1501-5
Specialised Surgery

“Some surgeons perform less than optimal surgery. Some are less competent technically than their colleagues; and some fail to supervise surgeons in training adequately.

... If by more meticulous attention to detail, the results of surgery could be improved, and our results suggest that this would not be difficult, the impact on survival might be greater than that of any of the adjuvant therapies currently under study.”

Quality assurance

Traditional Definition

The complete set of systematic actions that is required to achieve a treatment result that meets a certain standard
Quality assurance

• Clinical Effectiveness – quality care is care which is delivered according to the best evidence as to what is clinically effective in improving an individual’s health outcomes

• Safety – quality care is care which is delivered so as to avoid all avoidable harm and risks to the individual’s safety

• Patient Experience – quality care is care which looks to give the individual as positive an experience of receiving and recovering from the care as possible, including being treated according to what that individual wants or needs, and with compassion, dignity and respect.
Quality assurance

Definition of Quality

High quality care requires all three dimensions to be present

Clinical Effectiveness
Patient Experience
Patient Safety

This definition of quality has now been enshrined in legislation through the Health and Social Care Act 2012.
# Quality assurance

<table>
<thead>
<tr>
<th>Quality Assurance</th>
<th>Quality Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>To ensure quality requirements are being met</td>
<td>Supports immediate positive changes in delivering quality</td>
</tr>
<tr>
<td>Assesses compliance with standards</td>
<td>Uses standards as a basis for defining quality to improve practice</td>
</tr>
<tr>
<td>Uses data to compare actual with standards</td>
<td>Data used to drive improvement to achieve best practice</td>
</tr>
<tr>
<td>Actions intended to remedy variations from standards</td>
<td>Actions involve changing processes or systems to deliver improved practice</td>
</tr>
<tr>
<td>Repeated data collection required</td>
<td>Repeated data collection required</td>
</tr>
</tbody>
</table>
Quality assurance

Quality Assurance is:

• An assessment of quality of care by an external body often in terms of comparison against agreed threshold standards, to determine whether the quality of care is acceptable

• This judgement leads to further discussion as to whether and where ‘corrective actions’ are required to maintain or improve quality

• Quality Assurance also ensures that these actions are implemented through monitoring and review of progress

Kings Fund 2011.
Issues of quality assurance in cancer surgery

- Treatment decision making: MDT working
- Surgical technique
- Quality standards
- Centre and surgeon volumes
- Centralisation
- Clinical trials and outcomes
- Commissioning complex cancer surgery
- Measuring outcomes
Issues of quality assurance in cancer surgery

• Treatment decision making: MDT working
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MDT WORKING?

Medical Oncologists
Pathologists
Surgeons
Radiation Oncologists
Radiologists
Multidisciplinary management of cancer

• Controversial when first promoted
• Good evidence now exists that demonstrates overall long term survival benefits when patients are managed within MDTs
• But is it really necessary when dealing with early cancer (e.g. T1 N0 M0 breast carcinoma)?
• Legal requirement for all cancer patient management in many European countries

Wright FC et al. Eur J Cancer 2007; 43: 1002-10
Limitations on MDT working?

• Little high quality supportive evidence of efficacy until recently?

• Discordance of MDT decisions made and actions taken?

• Reasons for discordance:
  - unknown co-morbidity?
  - inadequate clinical information?
  - patient choice?
  - commoner for gastric and pancreatic cancers?

Limitations to MDT working?

- 149 (115 upper GI, 34 colorectal) consecutive cancer cases over 6 months at Roswell Park, Buffalo NY
- Reasons for discussion:
  - progression/metastases (44%)
  - case management (26%)
  - diagnosis (21%)
  - pathology (15%)
  - resectability (7%)
- Physicians certain of management plan pre-MDT 84%
- Change in management at MDT in 36%

Limitations to MDT working?

- Meta-analysis of literature on outcomes of MDTs for cancer 2005-2012
- Fifty one papers identified
- Better cancer outcomes identified:
  - colorectal
  - head and neck
  - breast
  - oesophageal
  - lung
- Associated with better clinical diagnostic and decision making

MDTs for cancer result in

- Better patient care and survival outcomes
- Improved consistency of decision making and delivery of treatment
- Better continuity, coordination and cost-effectiveness of care
- Optimal, appropriate and standardised decision making on diagnosis, follow up and patient support
- Reduced over-referrals, interventions, length of stay, operative morbidity and mortality

Non-adherence to MDT decisions

• Results in trend towards lower survival in lung cancer

• Reasons:
  - unknown co-morbidity
  - patient choice
  - more clinical information becoming subsequently available

Impact of multidisciplinary team working on the management of colorectal cancer

• Same-centre multidisciplinary management has benefits over multi-centre referred management:
  - reduced number of interventions
  - shorter length of stay
  - shorter delays in delivering care
  - better and more appropriate use of chemotherapy
  - decreased operative morbidity and mortality

• Specialist Stage IV colorectal MDT outcomes are superior to generic colorectal cancer MDTs

DECISION MAKING OUTSIDE OF A SPECIALISED MDT?
Surgical management and outcomes of colorectal cancer liver metastases

E. J. A. Morris¹, D. Forman¹², J. D. Thomas¹, P. Quirke³, E. F. Taylor¹, L. Fairley², the late B. Cottier⁴ and G. Poston⁵

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Correspondence to: Dr E. J. A. Morris, Northern and Yorkshire Cancer Registry and Information Service, Level 6, Bexley Wing, St James’s Institute of Oncology, St James’s Hospital, Leeds LS9 7TF, UK (e-mail: eva.morris@mycris.leedsth.nhs.uk)

Brit J Surg 2010; 97: 1110-8
Overall survival of patients in England (114,155) diagnosed with colorectal cancer between 1998-2004 according to stage at diagnosis

Landmark analysis of patients with Stage 4 at diagnosis who survived 1 year who did and did not undergo liver resection


**Fig. 5** Landmark survival analysis of patients with stage IV disease at diagnosis who survived 1 year and did or did not undergo liver resection. Dotted lines represent 95 per cent confidence intervals.
Use of liver resection in England for metastatic colorectal cancer: hospital by hospital analysis

1000% difference between worst and best performing hospital!

Percentage of patients receiving a liver resection within three years of resection of their colorectal primary

197 individual hospitals in England

Referral of colorectal cancer patients from all English hospitals for liver resection 1998-2004 (expressed as % of all CRC patients) adjusted for age, deprivation, year of diagnosis, stage and site of primary at diagnosis and co-morbidities (Charlson)

Patients treated with palliative chemotherapy for metastatic CRC Jan–Dec 2009 n=110

- Discussed at liver MDT n=37
- Not discussed at liver MDT n=73

Radiology reports and imaging requested

- Liver-only metastatic CRC n=55
- Multi-site metastatic CRC n=18

Imaging reviewed by 7 liver surgeons at 5 centres

- Graeme Poston, Hassan Malik, Steve Fenwick - Aintree
- Dave Berry - Cardiff
- Merv Rees - Basingstoke
- René Adam - Hôpital Paul Brousse, Villejuif
- Nic Vauthey - M D Anderson, Houston

- Each patient scored *
  1. Easily resectable
  2. Complex resectable
  3. Borderline resectable
  4. Irresectable
  5. Unable to comment on scan

Results expressed as waterfall plots

Non-experts’ opinions on resectability:
Bar plot to illustrate management decisions for each patient

All non-experts agreed non-resectable

Experts’ opinions on resectability

Only 10% complete concordance Between experts and non-experts

Significant number of treatment decisions were based on inadequate scans that were too poor to interpret accurately

55% change in decision from non-resectable to resectable/borderline

Kappa score = 0.577

• Imaging hepatic metastases
• 7. If the CT scan shows metastatic disease only in the liver and the patient has no contraindications to further treatment, a specialist hepatobiliary MDT should decide if further imaging to confirm surgery is suitable for the patient - or potentially suitable after further treatment - is needed.
SURGICAL TECHNIQUE?
Rectal Cancer: How it was


Early 1990’s

Local recurrence %

Years

Norway
Netherlands
Enker
Moriya
Heald
Results of the Norwegian programme to introduce TME

Norwegian Rectal Cancer Project (N = 3319)

Rectal Cancer: How it now is

DCRCG, N Engl J Med 2001;345:638-646

![Graph showing local recurrence rates over years for Norway and the Netherlands with TME and RT+TME treatments.](image-url)
QUALITY STANDARDS?
What are Quality Standards?

- A **quality standard** is a set of specific, concise statements that:
  - act as markers of high-quality, cost-effective patient care across a pathway / clinical area;
  - are derived from the best available evidence such as NICE guidance or other accredited sources;
  - are produced collaboratively along with partners, service users and carers.
What is the purpose of a Quality Standard?

• To make it clear what high quality care is by providing definitions of clinical and cost-effective care

• To support benchmarking of performance

• To provide information to patients, carers and the public about the quality of care they can expect
NICE Quality Standards:

QS20: Colorectal Cancer, August 2012

• Quality statement 6
• People with a contrast-enhanced computed tomography (CT) of the chest, abdomen and pelvis suggesting liver metastatic colorectal cancer have their scans reviewed by the hepatobiliary multidisciplinary team to decide whether further imaging is needed to confirm suitability for surgery
• Incorporated into NHS contracts April 2014
• Failure to comply will result in financial penalties
SURGEON AND CENTRE VOLUMES: CENTRALISATION?
Volume

“Patients can often improve their chances of survival substantially, even at high volume hospitals, by selecting surgeons who perform the operations frequently”

Detailed activity analysis 1999-2003: 3116 liver resections for CRC metastases performed by 305 surgeons in England!

- 154 performed 1 resection (many with 100% mortality)
- 82 performed 2 resections (several with 50% mortality)
- 23 performed 3 resections
- 17 performed 4 resections
- 8 performed 5 resections
- 2 performed 6 resections
- 1 performed 7 resections

Surgeon ranking by volume

Numbers of hepatectomies performed

Detailed activity analysis 1999-2003: 2679/3116 liver resections for CRC metastases performed by 50 highest volume surgeons (42 liver trained and 8 non-liver trained).


Swedish cancer registry 2006
Role of surgeon volume at high-volume hospitals

1998-9 Medicare population, from Birkmeyer et al., *NEJM*, 2003
Results after pancreatico-duodenectomy: hospital mortality per cluster

Long-Term Survival Is Superior After Resection for Cancer in High-Volume Centers

Yuman Fong, MD, Mithat Gonen, PhD, David Rubin, MS, Mark Radzyner, MBA, JD, and Murray F. Brennan, MD

Survival of patients subjected to pancreatic resection for cancer

P = 0.001
Five-year conditional survival comparing patients undergoing resection at highest-volume and lowest-volume quintile hospitals (adjusted for all covariates in the Cox model)

Bilimoria, K. Y. et al. 
J Clin Oncol 2008; 26:4626-4633
Five-year conditional survival comparing patients undergoing resection at highest-volume and lowest-volume quintile hospitals (adjusted for all covariates in the Cox model)

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COMMISSIONING HIGH QUALITY SURGERY?
English National Cancer Plan: Improving Outcomes Guidance

• First published in 2001: Relates to the management of all common cancers
• Specifies core membership of each MDT
• Common cancers (breast, primary colorectal, skin etc.) managed by every general hospital
• Complex cancer surgery (lung, oesophagus, stomach, pancreas, liver, bladder, sarcoma) centralised to regional centres
• HPB updated in 2013
• www.cquins.nhs.uk/download.php?d=resources/measures/HPB
English National Cancer Plan: 2013 Hepato-Pancreato-Biliary Cancer Measures

The specialist HPB MDT should have a catchment population for their specialist practice of at least 2 million for both primary HPB and liver metastases practices

Level one care for primary HPB cancers consists of:

- Tumour surgical resection (open and laparoscopic)
- Tumour ablative procedures (open, laparoscopic, percutaneous and endoscopic)
- Palliative, biliary, surgical bypass procedures
- Nuclear medicine treatment
- Percutaneous interventional procedures including selective internal radiation therapy (SIRT) and portal vein embolisation, except for percutaneous biliary drainage

www.cquins.nhs.uk/download.php?d=resources/measures/HPB
English National Cancer Plan: 2013 Hepato-Pancreato-Biliary Cancer Measures

Level one care for liver metastases consists of:

• Case discussion at the treatment planning meeting of the specialist HPB MDT
• Treatment plan (decision on suitability for radical treatment) by the specialist HPB MDT
• Treatment delivery under the care of a core member of the specialist HPB MDT
• Treatment delivery in the specialist HPB MDT's named single site for that treatment

Level one care delivers:

• Tumour surgical resection (open and laparoscopic)
• Open, laparoscopic, percutaneous and endoscopic tumour ablation
• Percutaneous interventional procedures including SIRT and portal vein embolisation

www.cquins.nhs.uk/download.php?d=resources/measures/HPB
English National Cancer Plan: 2013 Hepato-Pancreato-Biliary Cancer Measures

Key Clinical Indicators (numerators) measured against documented incidence (denominator):

- *Number of cases with confirmed histology*
- *Number patients having surgical resection*
- *One, two and five year survival (rate)*

www.cquins.nhs.uk/download.php?d=resources/measures/HPB
• Provision of specialised HPB surgical services (2012):
  - minimum population of 2 (ideally 3) million
  - based at major university hospitals
  - 5-7 HPB surgeons with 24/7 HPB surgical cover
  - weekly specialised HPB MDTs

• HPB Surgeon volumes (2011):
  - minimum surgeon annual liver volume 15-25 (10-15 major) resections
  - minimum centre annual volume 150 (75 major) resections

• 25 of 197 English general hospitals reimbursed for HPB surgery
MEASURING OUTCOMES?
Comparative audit of outcomes

Top down (numerator based): registry data

Bottom up (denominator based): population data
Basic concept of registries

- Outcomes registry
- Concurrent assessments of structure and process of care
  - Registry-based, site visits
- Analyses aimed at identifying best practices
- Broad implementation of such practices
- Outcomes tracking to confirm improvements
Long-term survival post hepatectomy

GJP data
Patient Survival post hepatectomy
746: patients

All LiverMetSurvey (31/12/2014)
Patient Survival post hepatectomy
All LiverMetSurvey population: 31325 patients
Logistics for quality assurance

Central Datacenter
Data managers and coordinators

- Local Data-manager
- Local surgeon
- Local pathologist
- Instructor surgeon
- Pathology Review Committee
- Local Radio-therapist
- Monitoring Committee
- Patient
mCRC treated at MD Anderson and Mayo clinics by year of diagnosis: OS

OS has improved substantially over the past 25 years

But so has the cost!!!!

2,470 patients from two highly specialized centers

Because......

• Metastatic colorectal cancer is now becoming a chronic condition rather than a terminal illness

• These patients are now becoming very expensive to treat if we are going to achieve long term survival like this, regardless of disease free status

• We don’t know the ideal treatment sequencing strategy to achieve optimal survival
CLIMB 1409
A Prospective Colorectal Liver Metastasis Database with an Integrated Quality Assurance Program

A Collaboration Project with the
1409: CLIMB Study Design

• Prospective observational cohort study with optional translational research

• Participating sites (ESSO and EORTC Network)
  – France
  – United Kingdom
  – Netherlands
  – Italy
  – Switzerland
  – Denmark
  – Norway
**1409: CLIMB Pathway**

Patients with liver limited metastatic colorectal cancer determined unresectable by MDT (Denominator)

→ Receive most effective high response rate systemic therapy

→ Outcome reviewed by MDT

**Operable (numerator):**
- Resect + ablation
- Two stage
- ALPPS

**Remains inoperable:**
- 2nd line therapy
- Converts?
- 3rd line therapy?

**Follow up and outcome:**
- PFS
- OS
- QOL
- Health economics
Can we compare outcomes?
QIPP

- **Q**uality, **I**nnovation, **P**roductivity, and **P**revention
- HPB surgery 2015-2016:
  - universal enhanced recovery programme
  - reimburse for maximum of 5 days in patient stay liver resection and 12 days for pancreas resection
  - procurement of both drugs and devices
- HPB surgery 2016-2017:
  - use of cross matching and blood transfusion
Can we compare outcomes?

CQUIN

- Commissioning for Quality and Innovation
- Takes 2 years to implement
- Capacity planning: don’t unnecessarily duplicate services
- Set national tariff for reimbursement
- Performance monitoring
- Quality dashboards
Can we compare outcomes?
Quality dashboards

Report Overview

Indicator reference
Indicator name

Period for which data is displayed
Numerator for this indicator
Denominator for this indicator
Actual value for this indicator
The mean value for all acute trusts in England
SPC Chart displaying variance for each indicator

Where data is available indicators will have an SPC sparkline showing the previous 8 data points. These are a condensed way to show variation and trend of Trust position against national expected limits.

Table:

<table>
<thead>
<tr>
<th>Domain</th>
<th>Theme</th>
<th>Indicator Name</th>
<th>Quarterly Indicators (Q4 2014)</th>
<th>Num</th>
<th>Denom</th>
<th>Value</th>
<th>National Mean</th>
<th>Chart</th>
<th>Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>CO - Clinical Outcome</td>
<td>GE5003</td>
<td>Proportion of test results that return a positive result for affected patients that have the test to determine a diagnosis and is seen in clinical practice</td>
<td>31</td>
<td>102</td>
<td>30.4</td>
<td>19.4</td>
<td><img src="chart1.png" alt="Chart" /></td>
<td><img src="trend1.png" alt="Trend" /></td>
</tr>
<tr>
<td>CP</td>
<td>CP - Clinical Process</td>
<td>GE5004</td>
<td>Proportion of patients who are treated in a safe environment and are protected from avoidable harm</td>
<td>15</td>
<td>283</td>
<td>5.0</td>
<td>8.6</td>
<td><img src="chart2.png" alt="Chart" /></td>
<td><img src="trend2.png" alt="Trend" /></td>
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</table>

Please note: due to confidentiality rules when a count of numerator and/or denominator is less than or equal to 5, both relevant numbers are suppressed to avoid potential identification.
Can we compare outcomes?

Quality dashboards

How to interpret charts

- If a trust is in this range their rate is much worse than expected by chance (2SD or 3SD)**
- If a trust is in this range their rate is worse than expected by chance (98.8% or 3SD)**
- If a trust is in this range their rate is better than expected by chance (2SD or 95%)**

This diamond represents the value for the acute trust.

The vertical bar represents the average value for all acute Trusts in England.

If a trust is in this range their rate is much better than expected by chance (99.8% or 3SD)**

The scale of each chart is dynamic to show a range that enables each measure to be viewed clearly for the trust in question. See Meta data document* for further information.

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The chart on the left shows a trust whose performance on this indicator is better than the national picture by a degree that is unlikely to be explained by random chance**

The two charts on the left shows a trust whose performance on this indicator does not differ from the national picture by more than can be explained by random chance**

The chart on the left shows a trust whose performance on this indicator is worse than the national picture by a degree that is unlikely to be explained by random chance**

The chart on the left is for an indicator that does not have a desired direction for improvement. The Trust shown in this example is within the expected range based on the national picture.
Can we compare outcomes?
Quality dashboards

<table>
<thead>
<tr>
<th>Dom</th>
<th>Thm</th>
<th>Annual Indicators (2013/14)</th>
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<tbody>
<tr>
<td>3</td>
<td>CP</td>
<td>HPB01 Proportion of patients with adenocarcinoma of the pancreas who have a curative resection</td>
</tr>
<tr>
<td>3</td>
<td>CP</td>
<td>HPB02 Mortality rate within 30 days of curative resection for adenocarcinoma of the pancreas</td>
</tr>
<tr>
<td>3</td>
<td>CP</td>
<td>HPB03 Mortality rate within 90 days of curative resection for adenocarcinoma of the pancreas</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPB07 LOS after pancreatoco-duodenectomy (J56X) for pancreatic adenocarcinoma</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPB08 Emergency readmission within 30 days of pancreatoco-duodenectomy for pancreatic adenocarcinoma</td>
</tr>
<tr>
<td>3</td>
<td>CP</td>
<td>HPB09 Re-operation rates within 30 days of pancreatoco-duodenectomy for pancreatic adenocarcinoma</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPB10 Proportion of patients with pancreatic adenocarcinoma who do not undergo curative resection who receive palliative chemotherapy</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPD13 Mean duration from date of referral by GP (or emergency admission to hospital) to curative resection</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPD14 Proportion of patients with pancreatic head or uncinate adenocarcinoma with serum bilirubin &lt;200mg/dl at presentation receiving curative resection without initial stent placement</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPD16 Proportion of patients with colorectal liver metastases whose imaging is discussed at HPB MOT</td>
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<td>3</td>
<td>CP</td>
<td>HPD17 Proportion of patients with colorectal liver metastases undergoing resection</td>
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<tr>
<td>3</td>
<td>CP</td>
<td>HPB18 Length of stay after right hemi-hepatectomy for colorectal cancer liver metastases</td>
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<tr>
<td>4</td>
<td>CP</td>
<td>HPB19 Emergency readmission rate at 30 days after right hemi-hepatectomy for colorectal cancer liver metastases</td>
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<tr>
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<td>CP</td>
<td>HPB20 30 day mortality after right hemi-hepatectomy for colorectal cancer liver metastases</td>
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<td>HPB21 90 day mortality after right hemi-hepatectomy for colorectal cancer liver metastases</td>
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<tr>
<td>4</td>
<td>CO</td>
<td>HPB23 Proportion of patients with colorectal liver metastases receiving ablation without resection, with curative intent</td>
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<tr>
<td>4</td>
<td>CO</td>
<td>HPB27 Percentage of patients with hepatocellular carcinoma receiving treatment with curative intent</td>
</tr>
<tr>
<td>5</td>
<td>CP</td>
<td>HPB28 Percentage of patients with hepatocellular carcinoma receiving liver transplant</td>
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</table>
Can we compare outcomes?
Quality dashboards

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<td>HPB81 Proportion of patients with adenocarcinoma of the pancreas who have a curative resection</td>
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<td>0.0</td>
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<td>HPB82 Proportion of patients undergoing elective surgery for adenocarcinoma of the pancreas</td>
<td>0</td>
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<td>HPB83 Proportion of patients undergoing elective surgery for adenocarcinoma of the pancreas</td>
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<td>HPB84 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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<td>HPB88 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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<td>HPB92 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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<td>HPB93 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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<td>HPB94 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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<td>HPB95 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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<td>HPB96 Proportion of patients undergoing elective surgery for pancreatic adenocarcinoma</td>
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Pancreatic cancer surgery **OK**
Liver cancer surgery **not OK!**
Recommendations

• Centers of Excellence in an ideal world
  – *Best for procedures which are uncommon, high risk, expensive and have wide variation in outcomes*

• Delivery of care closer to home by appropriately trained surgeons working in cancer networks

• Multidisciplinary team meetings pre- and postoperatively

• Outcomes-based quality improvement
  – *Greatest promise for really improving quality, but will require major investments*
Conclusions

- Quality assurance is mandatory
- Multidisciplinary working improves outcomes
- Centralisation increases volumes
- Increased centre and surgeon volumes improve outcomes
- Quality standards can be set
- Outcomes can be measured and compared