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HCC Surveillance Ultrasound: Audit and Service Evaluation

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Conflicts of interest

Dr Anmol Gangi-Burton:

- Clinical representative on the NHS England Hepatocellular carcinoma: delivering quality ultrasound surveillance Guidelines 2024
- BMUS Council Member
- BMUS Professional Standards Group Member

No financial COI

Alex Rourke:

- No COI

Content

NHS England

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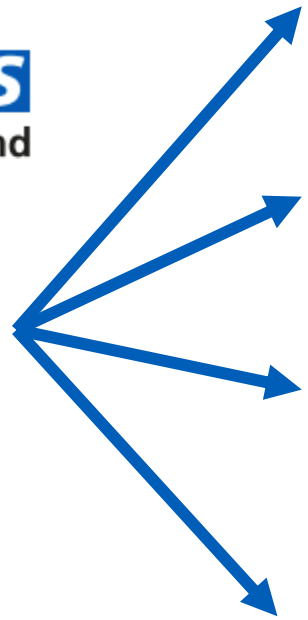
Hepatocellular carcinoma: delivering quality ultrasound surveillance



What can you audit / evaluate about your HCC surveillance service?

What are the benefits?

How do I start?

What does the guideline recommend?

What is the difference between Audit and Service evaluation?

Audit

- checks if practice meets a specific, predetermined standard

Service evaluation

- measures what standard a service currently achieves

Where should I start?

- USRLV

Statement 5: All HCC US surveillance episodes should be requested under a dedicated imaging procedure code for HCC US surveillance

What are the benefits?
- Can identify all USRLV patients!
- Request form information can be HCC surveillance specific
- Help booking team to allocate to correct operator
- We don't vet these! Saves time +++

How do I go about doing this?
- Set up "USRLV"
- Run a "RIS" search OR equivalent to quickly identify all "USRLV"

Troubleshooting:
- Can take a long time to get this set up but worth the trouble!
- Feedback to Hepatology referrers

Who should be involved in HCC surveillance Audit / Service evaluation?

- Lead sonographer
- Lead radiologist
- Ultrasound manager
- Data analyst
- Hepatology team

Statement 8: HCC US surveillance services should have a nominated **lead radiologist** and **sonographer** responsible for supporting training, service delivery and quality assurance

What are the benefits?

- Working together to prioritise, plan and do the work
- Different perspectives
- Dedicated time for Lead sonographer

How do I go about doing this?

- Regular HCC surveillance meetings/discussions
- Set priorities eg working out workload, lost revenue due to DNA

Troubleshooting:

- Named point of contact

We are...
Kind
Inclusive
Ambitious
One team
We are Nottingham University Hospitals

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Let us look at the rest of the statements!

Statement 6: Images obtained during HCC US surveillance examinations should be available for review on the PACS of the requesting healthcare organisation; and they should be available for review at the time of subsequent US examinations

Audit:

- Generate list of USRLV
- Review of consecutive HCC surveillance ultrasound images

Standard: 100%

Data to collect:

- Document number and % available on PACS
- Review reasons for no images on PACS

Statement 9: US machines used for HCC surveillance should be maintained to established quality standards and their technical set up should be optimised and standardised for HCC detection

Service evaluation:

- Annual quality assurance checks for machines and probes
- Review images when carrying out other service evaluation/audit to assess if machine quality is appropriate

Data to collect:

- Document how old US machines are

*** This may help with procurement: Consider replacement 4-6 years ***

Statement 10: hepatocellular carcinoma ultrasound (HCC US) surveillance should be performed by an appropriately trained and experienced sonographer or consultant radiologist

- HCC surveillance scans performed almost exclusively by sonographers at NUH

- Lead sonographer and radiologist worked together to design a standardised technique and report. Lead sonographer then did an HCC surveillance list with every single sonographer and trained them 1:1

So how many of these scans have been performed by an appropriately trained and experienced operator?

Statement 10: hepatocellular carcinoma ultrasound (HCC US) surveillance should be performed by an appropriately trained and experienced sonographer or consultant radiologist

Data to collect:

- Scans carried out by trained operator
- Surrogate marker of “training” = template report

Month	Total Scans	Scans NOT done according to protocol	% scans done according to protocol
Sep-24	11	2	82
Oct-24	120	65	46
Nov-24	155	54	65
Dec-24	187	55	71
Jan-25	114	38	67
Feb-25	163	54	67
Mar-25	123	23	81
Apr-25	233	96	59
May-25	243	61	75
Jun-25	217	49	77
Jul-25	145	11	92
Aug-25	164	31	81
Sep-25	148	23	84
Oct-25	200	9	96
Nov-25	236	5	98
Dec-25	197	No data	No data
Jan-26	169	5	97
Feb-26	156	4	97
Mar-26	156	2	99

Almost at 100%!

Statement 11: Imaging during HCC US surveillance examinations should focus on identifying HCC and the complications of liver disease

Focused scans at NUH since August 2025

- Liver, portal vein, spleen, ascites

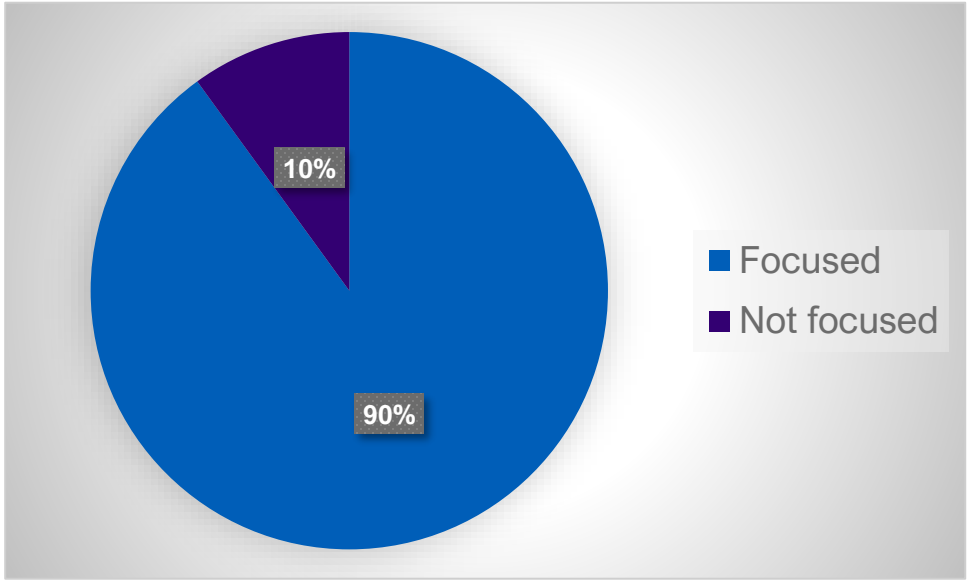
20 minutes allocated – time to be spent on the liver, not on other structures that have been checked before

<u>Data to collect:</u>

- Review how many focused vs not focused by reviewing the report
- Document reasons for not performing a focused study

Statement 11: Imaging during HCC US surveillance examinations should focus on identifying HCC and the complications of liver disease

- 50 consecutive patients (30/04/2026-12/05/2026)

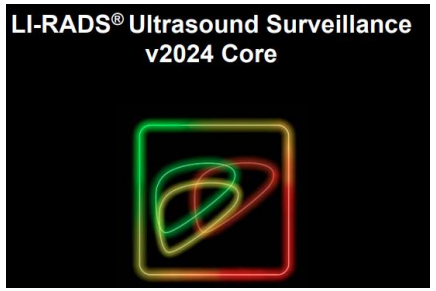


NUH results:

- 90% scans were focused.
- Reason for non-focused scans was lack of prior imaging.
- 10% of these examinations reported an incidental finding unrelated to the liver: 2 cholelithiasis, 2 dilated CD and one 36mm AAA

→ To feedback and re-assess!

Statement 12: Documentation of US surveillance examinations should use a standardised, structured report



Since 2024, we use an adapted Ultrasound LI-RADS classification system

We report using a template adapted from Ultrasound LI-RADS

Focused scan of the liver and associated complications.

Comparison: Reference made to: US CT MRI

Visualisation:

Score: Choose an item.

Percentage of liver assessed: Choose an item.

Examination restricted by: Click or tap here to enter text.

Liver observations (an observation is a distinctive area compared to background liver):

Score: Choose an item.

Observation characteristics if applicable: Click or tap here to enter text.

Has the observation been previously reported? Choose an item.

Liver parenchyma

Background liver: are there features of cirrhosis present? Choose an item.

Diffuse hepatic steatosis? Choose an item.

Vascular findings:

Portal vein: Choose an item.

Portal vein velocity (cm/s):

Hepatic veins: Choose an item.

Spleen: Size (cm): Click or tap here to enter text.

Ascites: Choose an item.

Abdominal aorta: Choose an item.

Other findings: Click or tap here to enter text.

Conclusion:

1. Choose an item.
2. Visualisation Score: Choose an item.
3. Ultrasound category: Choose an item.
4. Indirect signs of portal hypertension present? Choose an item.
5. Recommendation: Choose an item.

Follow up: Choose an item.

End of report

Data to collect:

- Review how many used structured report vs not
- Same as Statement 10!

Other data to consider:

- Time to further imaging
- Time to MDT discussion

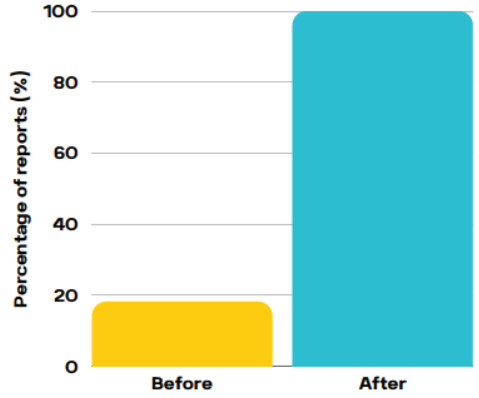
Statement 12: Documentation of US surveillance examinations should use a standardised, structured report

- All positive consecutive HCC surveillance scans between 01/06/2018 and 03/12/2024 were reviews

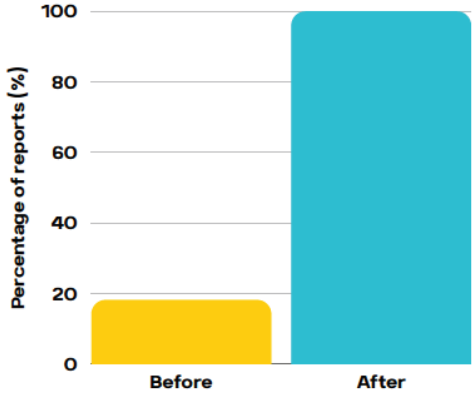
>95% now reported using template!

NUH results:

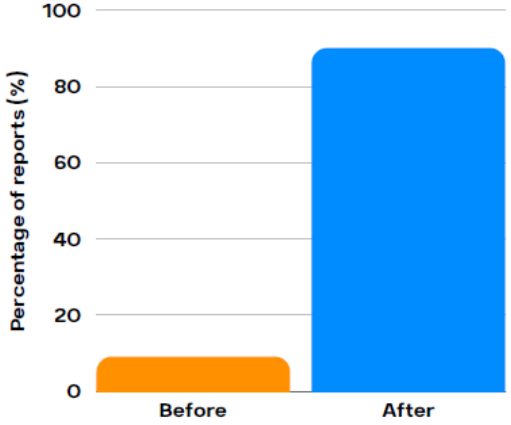
Documentation of a clear conclusion



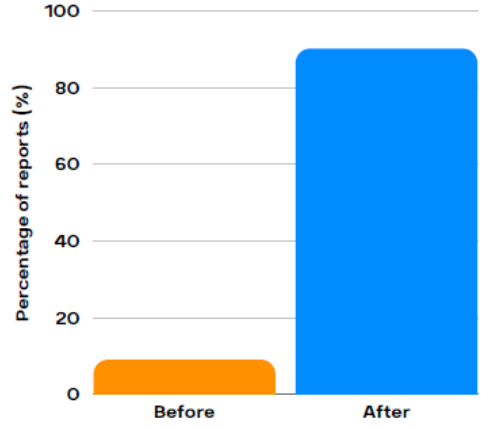
Documentation of follow-up recommendations



Hepatobiliary referral discussion recommended



Further characterisation imaging recommended

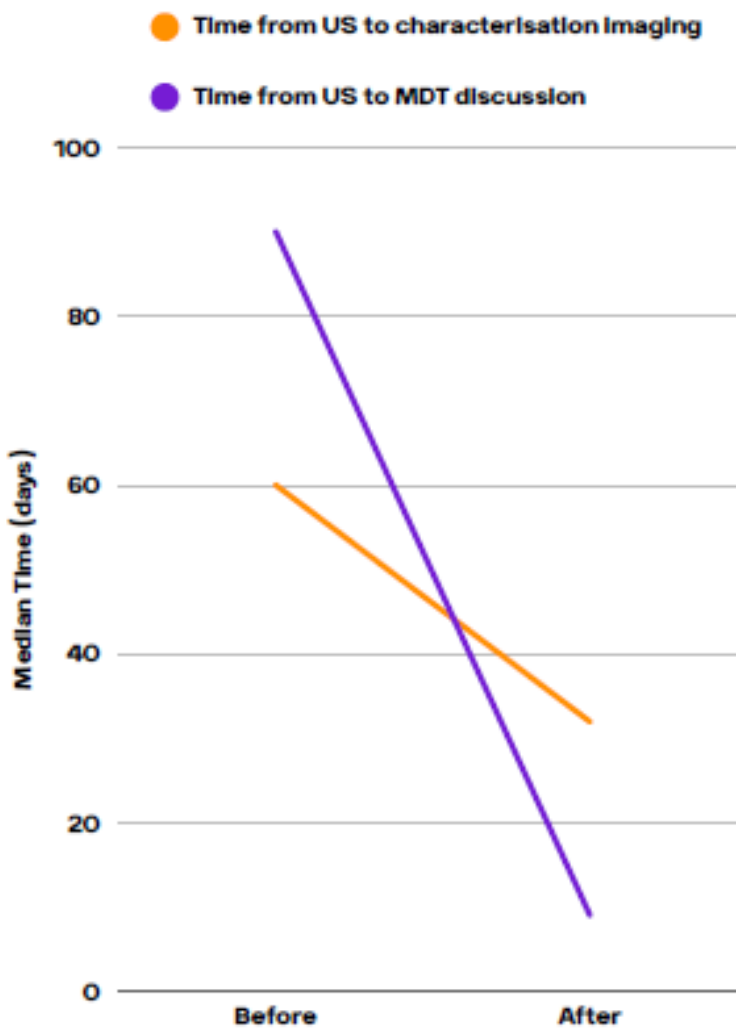


Statement 12: Documentation of US surveillance exam sed, structured report

- All positive consecutive HCC surveillance scans between 01/06/2018 and 03/12/2024 were reviews

NUH Results:

Time to next test AND time to MDT reduced!



Statement 13: Image capture during US surveillance should include standardised image and video capture to enable retrospective review and support interpretation of subsequent imaging examinations

We don’t specify standard still images at NUH

We do want three cineloops:

1) LS Liver sweeping through the entire left and right lobes
2) TS Liver at the level of the hepatic veins
3) TS Liver scanning cranially from the right kidney

<u>Data to collect:</u>

- Peer reviews – how many have the correct cineloops?

Statement 13: Image capture during US surveillance should include standardised image and video capture to enable retrospective review and support interpretation of subsequent imaging examinations

Adapted from BMUS's audit tool for peer review

- Reporting as specified images and cineloop
- Score should add up to 10
- Keep it friendly!

Ultrasound HCC Surveillance with LI-RADS – Audit tool

Adapted from BMUS (2014) Microsoft Word - PEER REVIEW AUDIT TOOL with logo

Date of scan	22-10-25
US Practitioner	S[redacted] P[redacted]
Machine	Canon
Patient	K[redacted], K[redacted], K[redacted]
Date of review	3-11-25
Reviewer	Alex Rourke

Image Quality (I)

Good image quality (3), Acceptable diagnostic quality (2), Poor image quality (1)

Score	Comment
3	Very nice! The sweeps are correct. If I'm being harshly picky it looks like on you are starting the recording a little bit into the sweeps (see K[redacted] Video 3 or K[redacted] Video 1)

Report Quality (R)

Optimal report structure and content (3), Acceptable report quality (2), Poor report quality (1)

Score	Comment
3	Nice reports. Remember to write the spleen size in the text box / delete the text box so it doesn't look like this: Spleen: Size (9cm): Click or tap here to enter text.

Clinical quality (C)

Yes (1) or No (0)

Question	Score	Comment
Was LI-RADS report appropriate?	1	
Correct use of US category?	1	
Correct use of US visualization?	1	
Appropriate advice and conclusion?	1	

Total score (out of 10) = 10 / 10 😊

Notes (taken from BMUS)

IMAGE QUALITY (I)

3 Good Image Quality

High quality examination. Organs identified by characteristic features and / or labelling. Appropriate measurements made. May include suboptimal images but with evidence that this was due to patient factors and attempts have beer made to address these.

2 Acceptable Diagnostic Quality

Reasonable image quality but a few poorer quality images and parameters (i.e. incorrect focus, measurement, protocol, colour, label, etc)

1 Poor Image Quality

Images of an unacceptable standard

REPORT QUALITY (R)

3 Report Content and Structure Optimal

Report answers clinical questions and gives appropriate advice and conclusion (within local guidelines). Report may also include additional clinical information gained from verbal feedback from patient and include documentation of any information given to the patient.

2 Report of Acceptable Quality

Report satisfactory but additional diagnosis or advice could have been provided

1 Poor Report Quality

Report of an unacceptable standard. List of descriptive findings with no attempt to correlate to clinical setting or answer clinical question posed. May also include disagreement with the report findings

Statement 14: Clinical and imaging teams should consider alternative imaging modalities for hepatocellular carcinoma (HCC) surveillance in patients where technical factors preclude adequate US image acquisition

VIS-C	Limitations significantly lower sensitivity

The patients who score a VIS-C are the ones where alternative imaging should be considered…

The patients who score a VIS-C are the ones where alternative imaging should be considered…

BUT how many have VIS-C?

Data to collect:

- Generate list of all USRLV (over 6 months or 1 year)
- Use a “search function” to find all VIS-C

NUH Results:

- 9% of HCC surveillance scans are scored VIS-C
- Ie 242 scans out of 2606 (01/01/2024-31/03/2026)

This means that, potentially, **126 people** currently having US surveillance at NUH should have alternative imaging

Statement 16: HCC US surveillance services should undertake regular audit of adherence with US surveillance

NUH struggles with attendance for US HCC surveillance scans

We've found that there are higher DNA rates on Mondays and Fridays, that people from more deprived areas DNA the most and that men are more likely to DNA

NUH is split over two sites: the site with worse transport links has more DNAs

NUH took part of the RADIANT national study: doing this we found that only 19% of respondents knew the scan was to do with cancer, the majority thought it was to monitor their liver disease (67%)

Month	Attendances	DNA	DNA Rate
Mar-25	123	26	17.45%
Apr-25	233	25	9.69%
May-25	243	33	11.96%
Jun-25	217	13	5.65%
Jul-25	145	23	13.69%
Aug-25	165	22	11.76%
Sep-25	148	24	13.95%
Oct-25	200	38	15.97%
Nov-25	236	40	14.49%
Dec-25	197	42	17.57%
Grand Total	**1907**	**286**	**13.04%**

A snapshot of patients who had a conversation with the sonographer at the end of the scan showed a dramatic improvement: just 2.4% of patients from this group failed to attend their next appointment

Statement 17: HCC US surveillance services should undertake regular quality assurance of US surveillance service delivery

- Quality assessment of obtained clinical HCC US surveillance images.
- Early detection rate: the number of HCCs diagnosed at an early or very early stage in patients participating in HCC US surveillance, expressed as a proportion of all HCCs diagnosed in patients participating in HCC US surveillance.
- Interval cancer rate: the number of interval HCCs diagnosed in patients participating in HCC US surveillance, expressed as a proportion of all HCCs diagnosed in patients participating in HCC US surveillance.
- False positive recall rate: the proportion of patients recalled for additional investigations following an HCC US surveillance episode, who are not subsequently diagnosed with HCC.

Statement 17: HCC US surveillance services should undertake regular quality assurance of US surveillance service delivery

- Early detection rate: the number of HCCs diagnosed at an early or very early stage in patients participating in HCC US surveillance, expressed as a proportion of all HCCs diagnosed in patients participating in HCC US surveillance.

Generate list of USRLV for 1 year and review HPB list of HCC

Data to collect:

- Number and % of for each stage

Stage	Surveillance	Incidental	Symptomatic	Total
Very early/early (0/A)	100 (55)	62 (35)	91 (26)	**263 (36)**
Intermediate/ advanced (B/C/D)	91 (45)	114 (65)	255 (74)	**460 (64)**

Statement 17: HCC US surveillance services should undertake regular quality assurance of US surveillance service delivery

- False positive recall rate: the proportion of patients recalled for additional investigations following an HCC US surveillance episode, who are not subsequently diagnosed with HCC.
  Generate list of USRLV for 1 year and review HPB list of HCC
  Use a search function to then find all “US-2” and “US-3”
  NUH: New US-2 or US-3 observation detected between 1st June 2018 – 31st May 2023

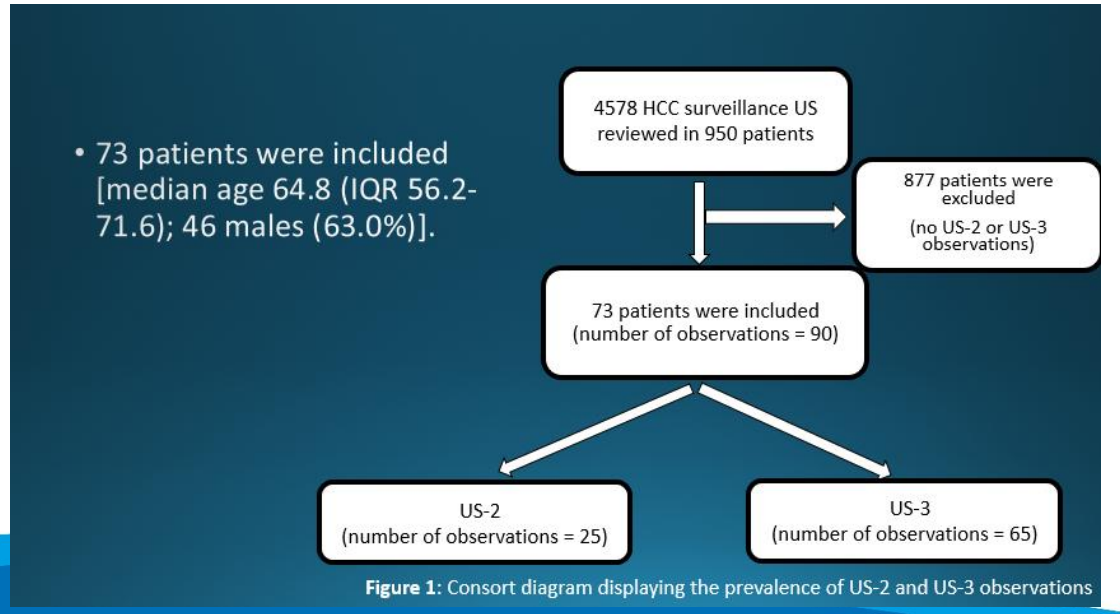


Figure 1: Consort diagram displaying the prevalence of US-2 and US-3 observations

	US-2	US-3	Total US-2 and US-3
Incidence [number (%)]	0.5% (25/4578)	1.4% (65/4578)	2.0% (90/4578)

Statement 17: HCC US surveillance services should undertake regular quality assurance of US surveillance service delivery

We've already talked about the peer review of scans and reports for quality assurance

But what about NUH's performance?

- 2606 scans reported using our protocol from 1 June 2024 up until 31 March 2026
- 2390 US-1 (92%), 107 US-2 (4%) and 109 US-3 (4%)
- 1193 VIS-A (46%), 1183 VIS-B (45%) and 242 VIS-C (9%)

We've followed up our observations. After characterisation with contrast enhanced imaging:

- 21 true positives: 0.8% of HCC surveillance US diagnosed a liver malignancy
- 116 false positives: 4.5% of HCC surveillance US referred for further imaging which found no malignancy

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Statement 17: HCC US surveillance services should undertake regular quality assurance of US surveillance service delivery

Delving deeper into the data…

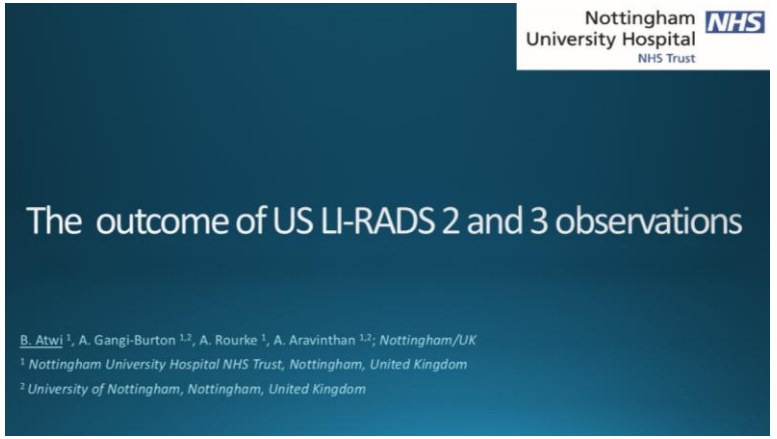
For example, in our first “batch” of data from 1-6-24 to 31-7-25:

Overall:	67 scans were US-2 and US-3:	There were 13 malignancies in this period:
Vis-A = 505 (46%)	19/67 (28%) were A	4/13 (31%) were A
Vis-B = 483 (44%)	32/67 (48%) were B	5/13 (38%) were B
Vis-C = 117 (11%)	16/67 (24%) were C	4/13 (31%) were C

Statement 17: HCC US surveillance services should undertake regular quality assurance of US surveillance service delivery

We've already talked about the peer review of scans and reports and how focused scans improve quality

We're able to compare against NUH's performance against figures from June 2018 to May 2023



Pre LI-RADS (1-6-18 to 31-5-23)

90 observations out of 4578 scans (2%)

9 observations confirmed to be malignant from 90 total observations

9/4578 = 0.2% of total scans

Post LI-RADS (1-6-24 to 31-3-26)

140 observations from 2606 scans (5.4%) *duplicates removed

21 observations confirmed to be malignant from 140 total observations

21/2606 = 0.8% of total scans

Statement 18: There should be dedicated radiology events and learning meetings (REALMs) for the HCC US surveillance service

Held our first REALM in March 2026!

Valuable use of time: going through these audits, as well as education and learning from specific cases

Used the US-2 and US-3 cases!

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Thank you for listening

Any questions?