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Can interactive data visualisation help clinicians improve patient care?

The webinar will start shortly.

In the meantime:

- All microphones are muted. We will unmute when needed.
- There will be opportunities to ask questions, either via the chat function or audibly. Please set your chat function to “Everyone”.
- The slides will be available after the webinar.

Please note the webinar will be recorded.

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Can interactive data visualisation help clinicians improve patient care?

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Chair

Paula Whitty

Paula Whitty is the Director of the North East Quality Observatory Service (NEQOS) as well as Joint Director of Research, Innovation and Clinical Effectiveness at Cumbria, Northumberland, Tyne and Wear NHS Foundation Trust.

Moderator

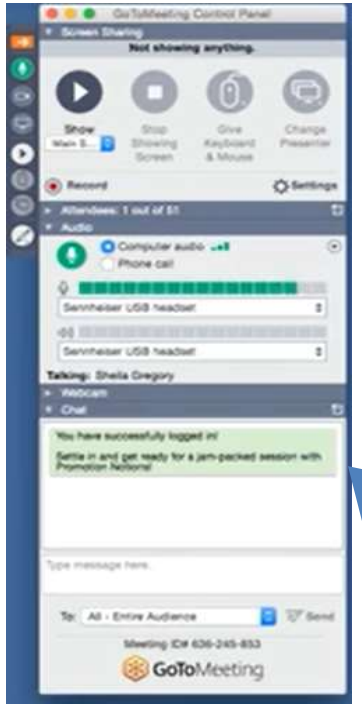
Valerie Corris

Valerie Corris is a Senior Analyst at the North East Quality Observatory Service (NEQOS).

Valerie has a wealth of experience in data management, analysis and interpretation.

Structure of the Webinar

- Introduction to the project
- Clinician requirements
- Draft design principles
- Key lessons from tool development
- Closing comments
- Opportunities to discuss and ask questions



To ask a question or comment:

1. Set “To” to “Everyone”
2. Type Comment or question in this box

We may ask if you wish to share the discussion with the audience in which case your microphone will be enabled remotely.

Funded by Health Foundation

- Good quality analysis and the ability to use information effectively is an essential element in any learning health care system.
- The **Health Foundation's Advancing Applied Analytics programme** aims to improve analytical capability in support of health and care services.
- Thanks to Imperial College Health Partnership for access to their hosting server.

Introduction to the Project

1. To engage with clinicians, to understand their requirements for interacting with data on quality of care, and to explore the ways in which interactive data visualisation in real 'day-to-day' practice can help them improve patient care.

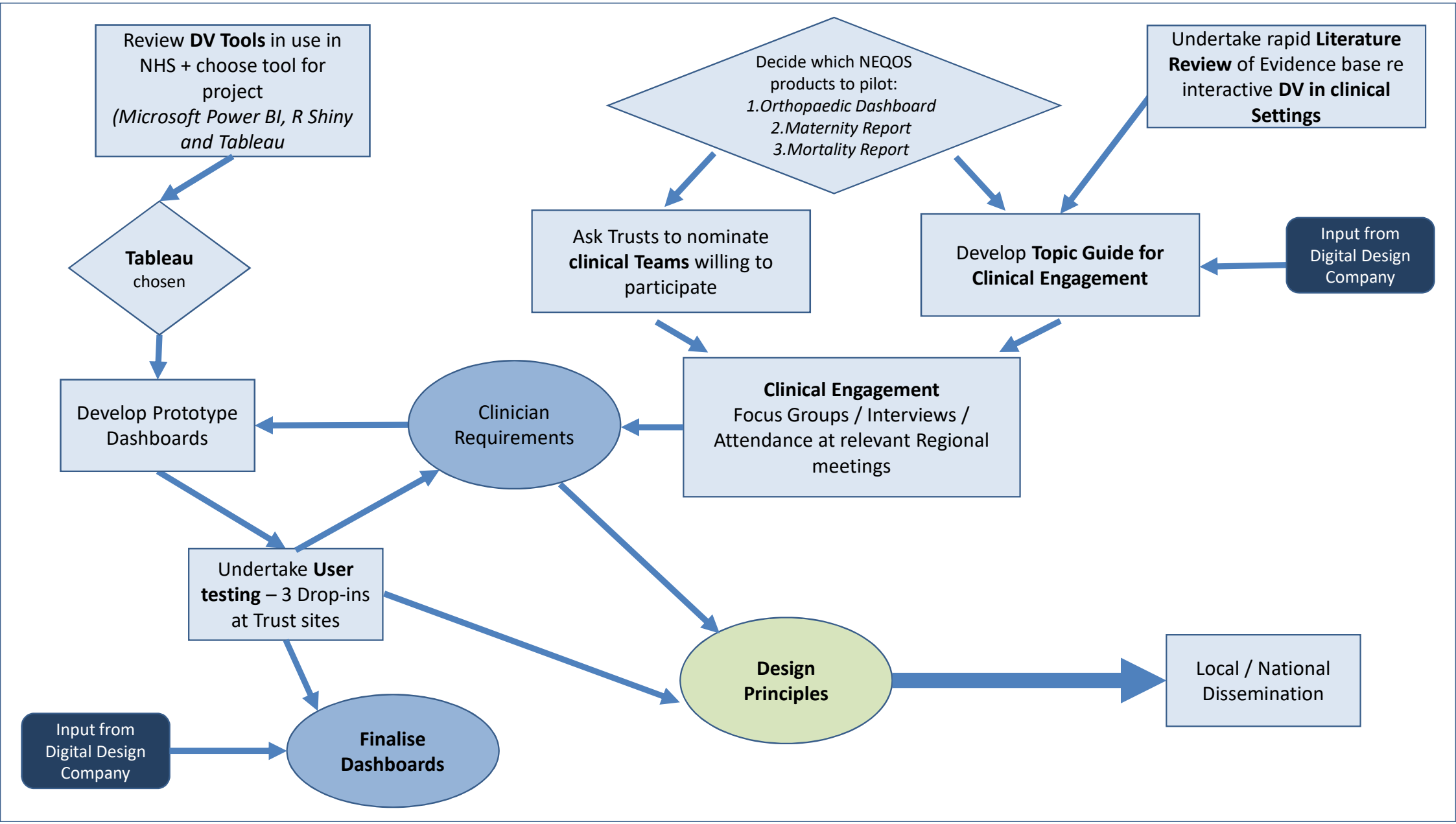
2. To use the insight gained in step 1, to adapt 3 existing NEQOS products using 'off-the-shelf' data visualisation software.

The products selected were:

- *Maternity profile*
- *Hip and knee dashboard**
- *Mortality report/slides**

** links to the latest version of these two dashboards provided*

3. To share the learning from the project locally, regionally & nationally.


Review **DV Tools** in use in NHS + choose tool for project *(Microsoft Power BI, R Shiny and Tableau*
Decide which NEQOS products to pilot:
1.Orthopaedic Dashboard
2.Maternity Report
3.Mortality Report
Undertake rapid **Literature Review** of Evidence base re interactive **DV in clinical Settings**
Tableau chosen
Ask Trusts to nominate **clinical Teams** willing to participate
Develop **Topic Guide for Clinical Engagement**
Input from Digital Design Company
Develop Prototype Dashboards
Clinician Requirements
Clinical Engagement Focus Groups / Interviews / Attendance at relevant Regional meetings
Undertake **User testing** – 3 Drop-ins at Trust sites
Design Principles
Local / National Dissemination
Input from Digital Design Company
Finalise Dashboards

Aim of today's webinar

- Share the lessons learnt from our engagement with clinicians on their requirements in relation to online interactive data visualisation(DV) tools and how they use data;
- Share some draft Design Principles for use with DV tools, developed during the course of this project, for feedback;
- Share key lessons learnt whilst trying to develop interactive dashboards to meet the clinicians' requirements.

Clinicians' requirements

Presented by Tony Roberts

Tony Roberts is Deputy Director of the North East Quality Observatory Service (NEQOS) and Deputy Director (Clinical Effectiveness) at South Tees Hospitals NHS Foundation Trust.

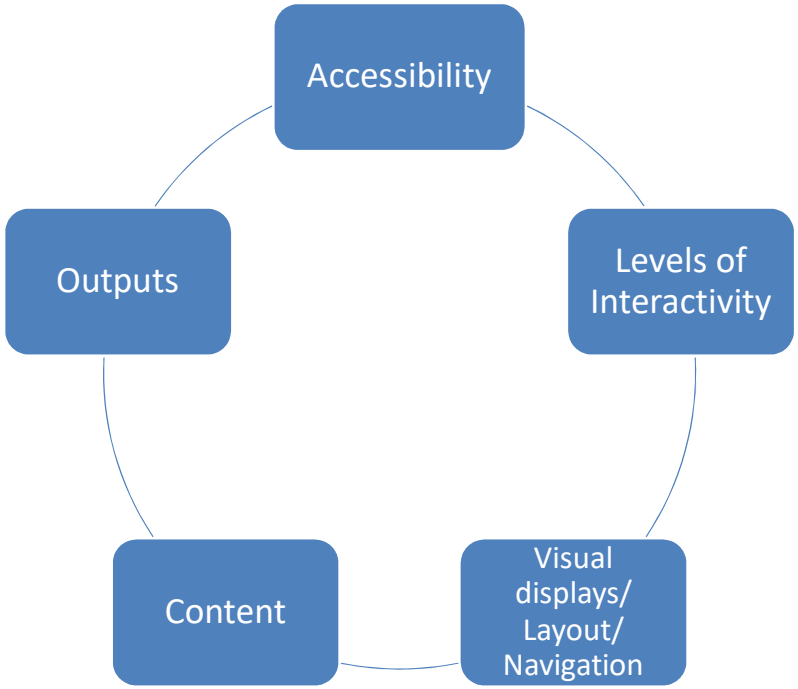
He is also the Patient Safety Lead for the North East and North Cumbria Academic Health Science Network.

He has worked in the NHS in acute hospital, primary care and health authority roles, always with a focus on measurement of quality and safety of care.

Tony has published in hospital mortality, cardiac care and primary care topics particularly using evidence based medicine and statistical process control methods.

Clinicians' requirements

Irrespective of the speciality / discipline, the requirements of the clinicians could be grouped into 5 categories:



Clinicians' Requirements

Accessibility

- Logging in must be as easy as possible
- Need to be able to download / print outputs (IT system reliability / accessing information "on the Go" (e.g. on the train)

Levels of Interactivity

- Ability to benchmark
- Ability to explore / interrogate / "deep dive" the data to ask their own questions, rather than a system providing pre-analysed metrics

Visual displays / layout / navigation

- Inclusion of text/ narrative to explain/ interpret the data
- Ability to have an 'At a glance' version, and ability to delve into the detail.

Clinicians' Requirements

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Content

- Timely data – including remove metrics that may no longer be relevant
- Setting an alert system (e.g.: when the chosen trust is an outlier / when the data has been updated and more specifically if the data for "my organisation" has changed).

Outputs

- Ability to create bespoke outputs.
- Need for both a static and an interactive version of outputs.
- Need to be able to extract charts from DV tool and insert into own presentations / reports, without the need for advanced IT skills.

Some comments from the ‘drop-in’ events

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“Static reports are good when you are time challenged whereas dynamic reports are good when you have time to spend.”

Clinical Drop-in Participant

- **Time Pressures**
- **IT limitations**
- **Familiarity**
- **Exploration**

“Will the interactive format look different to what I’m used to?”

Clinical Drop-in Participant

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Questions

Comments

BetterKnowledgeBetterCareBetterOutcomes

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Draft Design Principles

Presented by Lucy Lindsay

Lucy Lindsay is a Health Information Analyst at the North East Quality Observatory Service (NEQOS).

Lucy has a background of data analytics within both academia and healthcare settings. She has spent the last 10 years working in cancer research and developed international collaborations, publishing many papers.

Lucy has a Doctorate in diabetic neuropathy and a Masters in Public Health Service Research including medical statistics with a track-record in a variety of fields.

Summary of Draft Design Principles

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1. End-user (clinician) engagement in the design stages is essential for getting the functionality of an interactive data visualisation (DV) tool/dashboard right for them and ensuring acceptability.
2. Be clear about the main clinical question(s) for end-users and design the DV tool /dashboard accordingly.
3. Data should be as up-to-date as possible (and consider excluding data that is too old to answer the question(s)).
4. Ensure that the DV tool/ dashboard is self-explanatory to end-users to use (no significant IT skills / conventional User Manual required).
5. Be cognisant of recognised visual design principles.
6. Ensure that the DV tool/dashboard is easy to navigate.
7. Ensure that selections made within the DV tool/dashboard are retained as users navigate the dashboard / DV tool.
8. Ensure that the dashboard/ DV tool has the capability for outputs to be extracted for inclusion in users' own reports and presentations.
9. Include interpretive narrative where interpretation is required, ensuring that you avoid "busy" visuals and information overload.
10. Static and interactive dashboards both have a useful role, as static reports may still be required to be provide overviews of care quality and interactive DV tools/dashboards may be required to allow 'deep dives'.

Draft Design Principles (1) to (3)

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1. **End-user (clinician) engagement in the design stages is essential for getting the functionality of an interactive data visualisation (DV) tool/ dashboard right for them and ensuring acceptability.**
   - Clinicians involvement in the design phase allows exploration of how a clinician would use a dashboard/DV tool and therefore functionally is not based on supposition from the development team, this also increases acceptability.
2. **Be clear about the main clinical question(s) for end-users and design the DV tool / dashboard accordingly.**
   - When end-users would like to have an overview of their clinical unit they are asking a different set of questions than when exploring the data to find out in-depth information about different aspects of quality. A dashboard/visualisation should "filter the noise" so that the "signal" is easier to find in all the information.
3. **Data should be as up-to-date as possible (and consider excluding data that is too old to answer the question(s)).**
   - Decisions on quality of care should be made based on the most recent data available that is considered useful. It may be that metrics are excluded if the clinicians consider the underlying data to be too old to provide useful insights.

Draft Design Principles (4) to (7)

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4. Ensure that the dashboard / DV tool is self-explanatory to end-users to use (no significant IT skills / conventional User Manual required).

- Tools and their navigation need to be self-explanatory and should not require a qualification in IT/Computing to be able to interact with the data with little lead-time. There should be no need for a conventional user manual.

5. Be cognisant of recognised visual design principles.

- There needs to be a good balance between visual complexity and information utility. It is important that there is consistency both across a single dashboard and across a set of dashboards (branding).

6. Ensure that the DV tool / dashboard is easy to navigate.

- Navigation through a dashboard needs to be clear. The order or flow of metrics should make sense to clinicians. Don't assume that users will navigate the tool the way that you intended.

7. Ensure that selections made within the DV tool / dashboard are retained as users navigate the DV tool/ dashboard.

- It is important that the selections make in one section of the dashboard are retained across all sections of the dashboard, ensuring that the visualisations are correctly interpreted. To maximise the productivity of an interactive dashboard it should be possible for a user to save their queries to re-run again at a future date.

Draft Design Principles (8) to (10)

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8. **Ensure that the dashboard /DV tool has the capability for outputs to be extracted for inclusion in users' own reports and presentations.**
   - Not only should it be possible to extract the outputs but the layout of the charts should be conducive to extraction from the visualisation tool (i.e. interpretive text does not overlap the chart).

9. **Include interpretive narrative where interpretation is required, ensuring that you avoid "busy" visuals and information overload.**
   - Clinicians requested interpretive narrative where the definition of a metric or the meaning of the data is not obvious. However too much explanatory text on a viz is unhelpful and should not obscure the contents of the charts.

10. **Static and interactive dashboards both have a useful role, as static reports may still be required to provide overviews of care quality and interactive DV tools/ dashboards may be required to allow 'deep dives'.**
    - Don't assume that if you have produced an interactive product this means that the static product is no longer required. Both types of reports (static and interactive) have distinct roles which are both beneficial to clinicians.

Draft Design Principles

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Questions

Comments

Key lessons from tool development

Presented by Kayoung Goffe

Kayoung Goffe is a Health Information Analyst at the North East Quality Observatory Service (NEQOS).

Having gained a distinction in an MSc in Geographical Information Systems at the University of Leeds in 2005, Kayoung has a strong analytical background and has held research positions both in the UK and her native South Korea which include research assistant at the Korean Research Institute for Human Settlements and research assistant in the Department of Epidemiology and Biostatistics at Imperial College.

She is currently studying for a part-time Masters degree in Data Science at Newcastle University.

Key lessons from tool development

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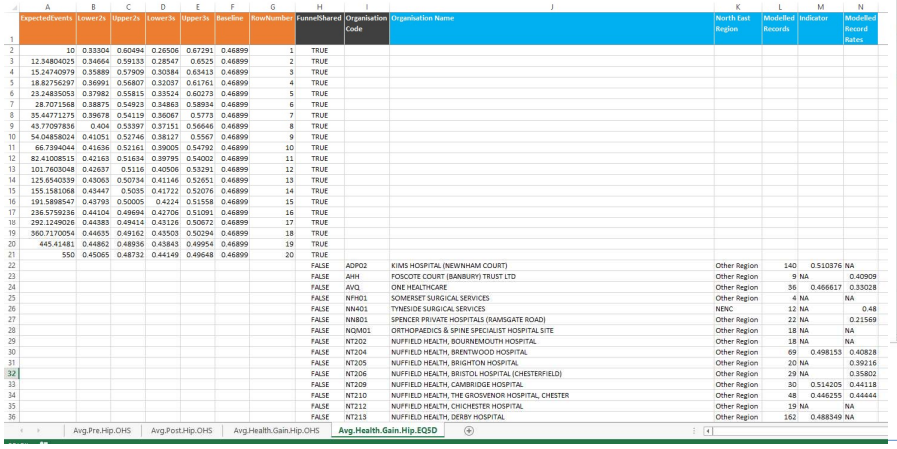
- UX design is challenging without specialist skills / training, and it requires lots of time:
  - Conducting insightful user interviews is one of the keys to a successful product.

- How time consuming and difficult it was to choose DV software.

- Tableau is not a fully-fledged application development tool:
  - Advised to build HTML/CSS dashboards with embedded Tableau visualisations.

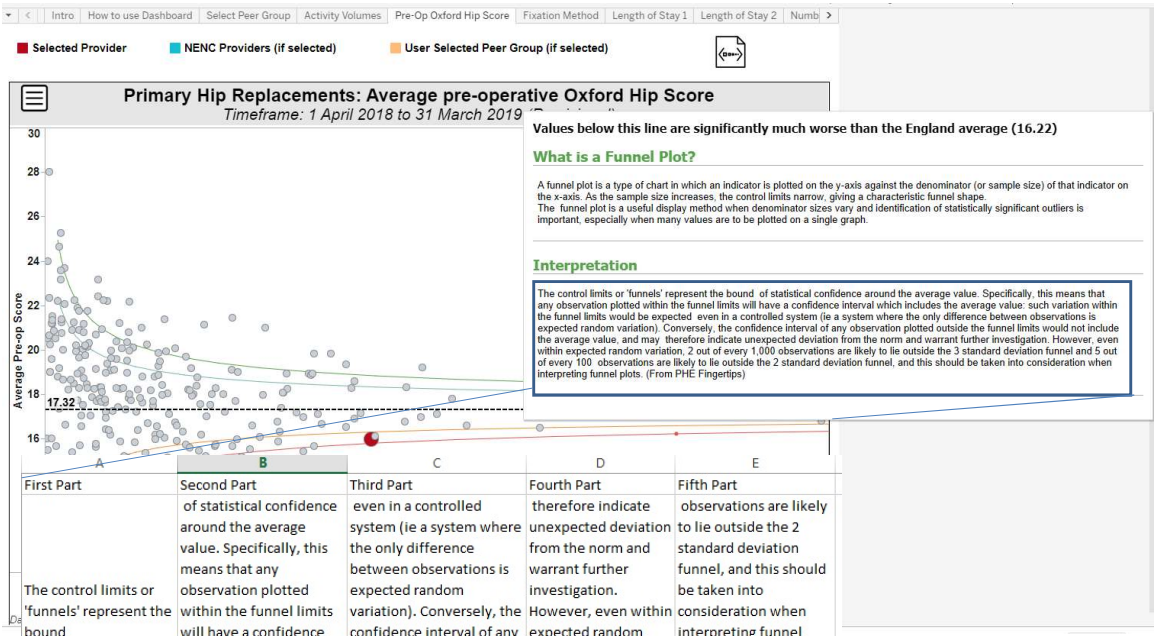
- Sometimes Tableau is not so straightforward:
  - Data processing is done in R, Tableau is mainly for visualisation
  - Funnel plots
  - Tooltips

[Funnel plot template]



ExpectedEvents	Lower2s	Upper2s	Lower3s	Upper3s	Baseline	RowNumber	FunnelShared	Organisation Code	Organisation Name	North East Region	Modelled Records	Indicator	Modelled Record Rates
10	0.33304	0.60494	0.26506	0.67291	0.46899	1	TRUE						
12.34804025	0.34664	0.59133	0.28547	0.6525	0.46899	2	TRUE						
15.24740979	0.35889	0.57909	0.30584	0.63413	0.46899	3	TRUE						
18.82756297	0.36991	0.56807	0.32037	0.61761	0.46899	4	TRUE						
23.24835053	0.37982	0.55815	0.33524	0.60273	0.46899	5	TRUE						
28.7071568	0.38875	0.54923	0.34863	0.58934	0.46899	6	TRUE						
35.44771275	0.39678	0.54119	0.36067	0.5773	0.46899	7	TRUE						
43.77097836	0.404	0.53397	0.37151	0.56646	0.46899	8	TRUE						
54.04858024	0.41051	0.52746	0.38127	0.5567	0.46899	9	TRUE						
66.7394044	0.41636	0.52161	0.39005	0.54792	0.46899	10	TRUE						
82.41008515	0.42163	0.51634	0.39795	0.54002	0.46899	11	TRUE						
101.7603048	0.42637	0.5116	0.40506	0.53291	0.46899	12	TRUE						
125.6540339	0.43063	0.50734	0.41146	0.52651	0.46899	13	TRUE						
155.1581068	0.43447	0.5035	0.41722	0.52076	0.46899	14	TRUE						
191.5898547	0.43793	0.50005	0.4224	0.51558	0.46899	15	TRUE						
236.5759236	0.44104	0.49694	0.42706	0.51091	0.46899	16	TRUE						
292.1249026	0.44383	0.49414	0.43126	0.50672	0.46899	17	TRUE						
360.7170054	0.44635	0.49162	0.43503	0.50294	0.46899	18	TRUE						
445.41481	0.44862	0.48936	0.43843	0.49954	0.46899	19	TRUE						
550	0.45065	0.48732	0.44149	0.49648	0.46899	20	TRUE						
							FALSE	ADP02	KIMS HOSPITAL (NEWNHAM COURT)	Other Region	140	0.510376	NA
							FALSE	AHH	FOSCOTE COURT (BANBURY) TRUST LTD	Other Region	9	NA	0.40909
							FALSE	AVQ	ONE HEALTHCARE	Other Region	36	0.466617	0.35028
							FALSE	NFH01	SOMERSET SURGICAL SERVICES	Other Region	4	NA	NA
							FALSE	NN401	TYNESIDE SURGICAL SERVICES	NENC	12	NA	0.48
							FALSE	NN801	SPENCER PRIVATE HOSPITALS (RAMSGATE ROAD)	Other Region	22	NA	0.21569
							FALSE	NQM01	ORTHOPAEDICS & SPINE SPECIALIST HOSPITAL SITE	Other Region	18	NA	NA
							FALSE	NT202	NUFFIELD HEALTH, BOURNEMOUTH HOSPITAL	Other Region	18	NA	NA
							FALSE	NT204	NUFFIELD HEALTH, BRENTWOOD HOSPITAL	Other Region	69	0.498153	0.40828
							FALSE	NT205	NUFFIELD HEALTH, BRIGHTON HOSPITAL	Other Region	20	NA	0.39216
							FALSE	NT206	NUFFIELD HEALTH, BRISTOL HOSPITAL (CHESTERFIELD)	Other Region	29	NA	0.35802
							FALSE	NT209	NUFFIELD HEALTH, CAMBRIDGE HOSPITAL	Other Region	30	0.514205	0.44118
							FALSE	NT210	NUFFIELD HEALTH, THE GROSVENOR HOSPITAL, CHESTER	Other Region	48	0.446255	0.44444
							FALSE	NT212	NUFFIELD HEALTH, CHICHESTER HOSPITAL	Other Region	19	NA	NA
							FALSE	NT213	NUFFIELD HEALTH, DERBY HOSPITAL	Other Region	162	0.488349	NA

Avg.Pre.Hip.OHS | Avg.Post.Hip.OHS | Avg.Health.Gain.Hip.OHS | Avg.Health.Gain.Hip.EQ5D



A	B	C	D	E
First Part	Second Part	Third Part	Fourth Part	Fifth Part
The control limits or 'funnels' represent the bound	of statistical confidence around the average value. Specifically, this means that any observation plotted within the funnel limits will have a confidence interval which includes the average value: such variation within the funnel limits would be	even in a controlled system (ie a system where the only difference between observations is expected random variation). Conversely, the confidence interval of any observation plotted outside the funnel limits would not include the average value, and may	therefore indicate unexpected deviation from the norm and warrant further investigation. However, even within expected random variation, 2 out of every 1,000 observations are likely to lie outside	observations are likely to lie outside the 2 standard deviation funnel, and this should be taken into consideration when interpreting funnel plots. (From PHE Fingertips)

[Excel file structure for tooltip]

Questions

Comments

Closing comments

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Chair

Paula Whitty

- Any final comments or questions?
- Any further comments or thoughts, please **email neqos@cntw.nhs.uk**
- Questions not addressed today will be answered on the webpage.
- What happens next:
  - webinar and slide pack will be on our webpage (www.neqos.nhs.uk)
  - dashboards will remain available until the end of the week.
- Thank you for participating!