SBAR – Predicted data activity for the Wales Trauma Network

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SITUATION

The Trauma Network commissioned an analysis of current and predicted activity to inform future planning assumptions for the development of the network. This work was undertaken by Gareth John, NWIS and Andrew Nelson, Information and Performance Manager, Cardiff and Vale University Health Board. This paper describes the nature of the modelling undertaken; it's underpinning assumptions and builds on an earlier version. Following on from the network meeting on the 21st January 2019, network board members were asked to share version 3 of the paper with relevant colleagues in their own organisation and provide feedback. The current iteration reflects the feedback received, where appropriate. A table summarising the feedback and responses is provided as an Appendix and should be read in conjunction with this paper.

The Network Board is asked to note these assumptions and approve the data set as a single data source for all Health Boards when undertaking service planning in advance of the go live of the Trauma Network.

BACKGROUND

Early predicted activity data in relation to trauma was captured as part of:

Firstly, basic modelling work undertaken during the Major Trauma consultation process in 2017. This modelling estimated that the total number of major trauma cases across the network was approximately 1,500.

Secondly, the basic modelling was complemented by the EMRTS Strategic Outline Programme population based modelling in 2014. The latter was supported by Peter Oakley the then Clinical Lead for Major Trauma, University Hospitals of North Midlands Major Trauma Centre (Stoke) and the South Wales Collaborative.

Subsequently, the Network Board identified the need to undertake a more in depth analysis of current and predicted activity to inform the planning of the Trauma Network. A number of strategies have been adopted to achieve this:

1. Approached the Trauma Audit Research Network (TARN) – to calculate the expected number of patients from observed, modelling against comparable English Trauma Networks.

   OUTCOME – **predicted change for our network did not fit with what would happen in practice.**

2. Population based approach was undertaken (Dindi Gill/Melissa Rossiter) with application of the overall observed change in flow for NHSE following the regionalisation of Major Trauma care in 2008 (Moran *et al* 2018).

   OUTCOME – **many assumptions, crude estimations and predicted change appeared low in comparison with experience in NHS England in isolation of further detailed analysis**

3. The Network Board commissioned Gareth John, NWIS and Andrew Nelson, Information and Performance Manager, Cardiff and Vale Health Board to undertake a detailed analysis of current and predicted activity when the Trauma Network becomes operational

OUTCOME - **Data set best fit with experience in NHS England.**

Based on above it was decided to go ahead with presenting Strategy 3, as it provides the most robust methodology and analysis

ASSESSMENT

TARN datasets

Figure 1: TARN data reported 2016-17 including percentage case ascertainment for the Wales Trauma Network sites split by Injury Severity Score (ISS).*

Site	1-8	9-15	>15	Total	% Case ascertainment**
Morriston	138	253	197	588	**114%**
POW	14	18	17	49	24%
Aneurin Bevan HB	0	1	0	1	0%
UHL (Llandough)	9	7	5	21	35%
UHW	122	181	335	638	89%
PCH	85	111	50	246	**111%**
Royal Glam	52	84	48	184	**96%**
Bronglais	45	60	35	140	**150%**
Glangwilli	16	22	3	41	16%
Withybush	1	0	0	1	1%
Total	**482**	**737**	**690**	**1909**	**64%**

Purpose of above is to illustrate the variability in the case ascertainment and therefore the challenges in using existing TARN data for making baseline planning assumptions. It is noted that the experience of the English Trauma Networks is that case ascertainment has significantly increased since their establishment and improved the reliability of their datasets.

*Injury Severity Score – Retrospective anatomical score that measures the overall severity of injured patients (ISS 1-8 – minor trauma, ISS 9-15 – moderate trauma, ISS>15 – major trauma).
** Case ascertainment – patients submitted to TARN compared to expected based on Patient episode data for Wales (PEDW), where case ascertainment exceeds 100%, this indicates that more cases have been submitted to TARN than expected based on PEDW.

TARN inclusion criteria

1. **Trauma patients: Irrespective of age**
2. **Who fulfil <u>one</u> of the following length of stay criteria:** In hospital for ≥3 days, admitted to a critical care area (regardless of length of stay - LOS), transferred out for specialist care or repatriation* (total LOS ≥3days), transferred in for specialist care or repatriation* (total LOS ≥3 days), deaths (including deaths in ED
3. **AND whose <u>isolated</u> injuries meet one of a number of criteria**

Figure 2: Expected cases modelled on TARN data reported 2016-17 (Table 1) using hospitals with good case ascertainment

Site	1-8	9-15	>15	Total
Morriston	143	227	147	517
Princess of Wales	58	91	59	209
Aneurin Bevan HB	161	255	166	582
UHL (Llandough)	9	7	5	21
UHW	122	181	335	638
PCH	61	97	63	221
Royal Glam	53	84	55	192
Bronglais	26	41	27	94
Glangwilli	70	111	72	254
Withybush	41	65	42	148
Total	**744**	**1159**	**971**	**2876**

Based on TARN data submissions 2016-17, modelling was undertaken using the 4 hospitals with highest TARN case ascertainment. These are highlighted in Table 1 as in **bold**. UHW was excluded in order to avoid bias (tertiary referral hospital).

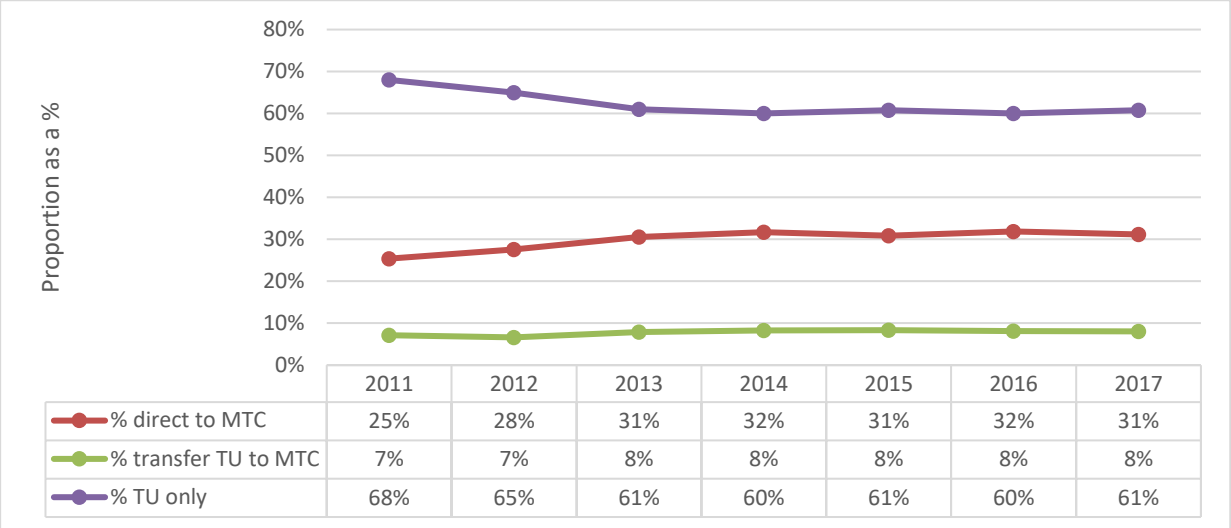
It should be noted that the above dataset is presented as cases and <u>not</u> hospital spells. Therefore, although useful for benchmarking, direct comparison between the TARN dataset and subsequent analyses based on hospital spells is not possible.

It should also be noted that it is likely that since April 2015, a change in the flow of moderate and major trauma patients has already occurred given the introduction of a 12hr EMRTS.

Changes in flow of patients across the English Trauma Networks (2011-2017) used for predicting local change

In version 3 of this paper, the 2017 change in flow data was used from the English Networks, rather than the incremental change by year. Most of the English Trauma Network became operational in April 2012. Thus, TARN were approached to understand the change in flow from 2011-2017 and the potential change is illustrated in Figure 3 and 4 below:

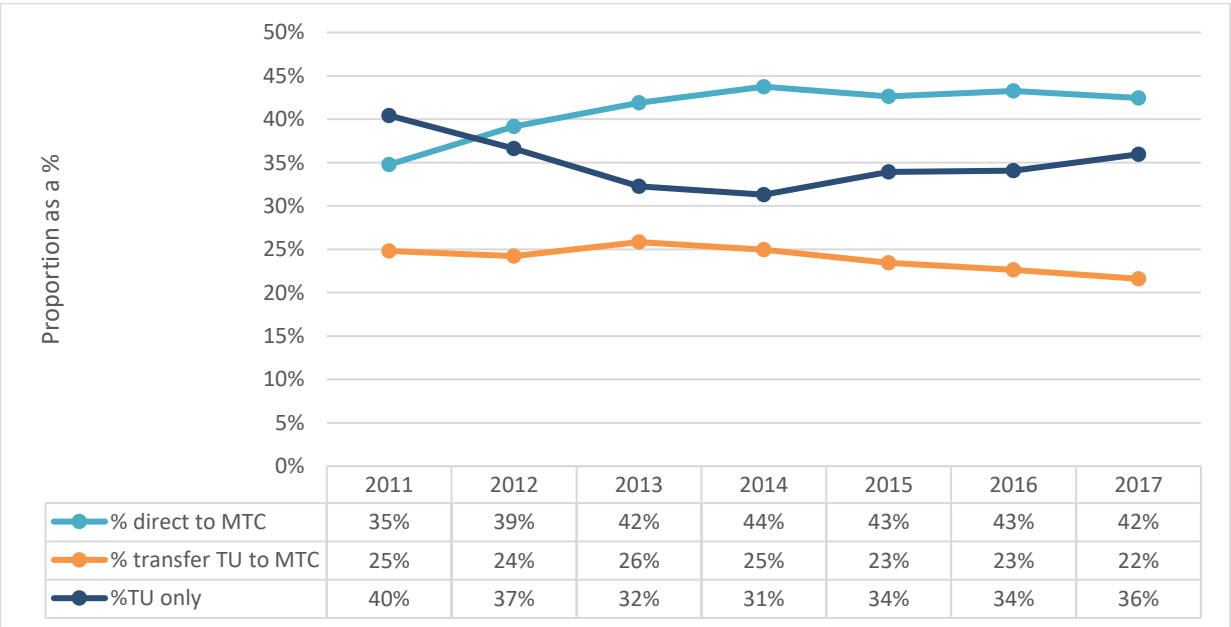
Figure 3: Total TARN cases reported (ISS 9-15), by 'patient pathway' over time



	2011	2012	2013	2014	2015	2016	2017
% direct to MTC	25%	28%	31%	32%	31%	32%	31%
% transfer TU to MTC	7%	7%	8%	8%	8%	8%	8%
% TU only	68%	65%	61%	60%	61%	60%	61%

From the above the proportion of moderate trauma cases taken direct to MTC's from 2011 to 2013 increased then reached a steady state.

Figure 4: Total TARN cases reported (ISS >15), by 'patient pathway' over time



	2011	2012	2013	2014	2015	2016	2017
% direct to MTC	35%	39%	42%	44%	43%	43%	42%
% transfer TU to MTC	25%	24%	26%	25%	23%	23%	22%
%TU only	40%	37%	32%	31%	34%	34%	36%

MTC – Major Trauma Centre TU – Trauma Unit

From the above the proportion of major trauma cases taken direct to the MTC's from 2011 to 2013 increased then reached a steady state. The proportion of major trauma cases transferred from TU's to MTC's is falling.

Based on the above, the proportions for 2011 – 2013 were taken forward to predict the change in flow in the subsequent analyses, as by 2013 the proportions for direct to MTC reached a steady state.

Whilst a steady state appears to have been reached with respect to the above proportions, the overall number of moderate and major trauma cases reported to TARN appear to be increasing (approx. 10%/year for major trauma) and have not reached a steady state. This is likely due to the improvements in case ascertainment through the introduction of the English Trauma Networks.

The TARN dataset was then used to model the current positon for moderate and major trauma, which has indicated that the assumed current position for South, Mid and West Wales pre-dates 2011 as illustrated below and forms the basis of subsequent analyses:

Figure 5: Assumed current proportions for South, Mid and West Wales and years 1, 2 and 3 (corresponding to 2011, 2012 and 2013) for moderate and major trauma by 'patient pathway'

ISS	'Patient pathway'	Assumed current position	Year 1	Year 2	Year 3 & steady state
9-15	% direct to MTC	22	25	28	31
9-15	% transfer TU to MTC	0	7	7	8
9-15	% TU only	78	68	65	61
>15	% direct to MTC	32	35	39	42
>15	% transfer TU to MTC	6	25	25	22
>15	% TU only	62	40	36	36

KEY ASSUMPTION(S)

1. Whilst providing an indication of the average experience across the differing English Trauma Networks, direct correspondence with Professor Chris Moran (National Clinical Director for Trauma - NHS England) indicated that it would be acceptable to use this information to inform the predicted change in flow across the Wales Trauma Network, given the similarities in population and accident rates with England.

2. Although a change in the proportion of cases by ‘patient pathway’ may actually be occurring, this may be a reflection of the increase in cases reported to TARN over time. The modelling does not take into account this increase in reporting.

Modelled predicted change by hospital spells

Patient episode data for Wales (PEDW) was obtained from NWIS for 2017 to calculate current activity. Current activity was defined as the number hospital spells and NOT number of cases so the subsequent analyses cannot be directly compared with Figures 1 and 2. ICD-10 codes were translated into TARN codes, in order to present a breakdown by ISS. Furthermore, hospital spells were used rather than number of cases, as a more accurate metric for making planning assumptions.

A complex modelling algorithm was developed in order to inform the data presented for current activity; this was 'developed' on 5 years of C&V Health Board data. Specialist cases undertaken at Morriston Hospital are acknowledged to be missed by this approach: as a consequence volumes at Morriston Hospital will be slightly understated **but** the proportion and volumes of patients whose flow changes maybe more accurate. These specialist cases are being assessed as part of the orthoplastic work stream.

Further analysis was undertaken to predict the change in flow, in line with the assumed current position for South, Mid and West Wales and using the proportions for the English Trauma Networks for 2011, 2012 and 2013 (presented in Figure 5).

These analyses are presented in the Figures below, with the following assumptions applied.

KEY ASSUMPTION(S)

1. One hospital spell covers the activity whilst a patient remains within that hospital for a continuous length of time (if they go out to another hospital and come back, that equates to three spells for the patient, even if within 1 year).

2. Flow predictions based on maximum stay of 21 days (Moran *et al*, 2018 - where data from 5 years of experience in England indicated a median length of stay of 15 days for all patients – IQ range 5-19).

3. Where the length of stay for the original spell exceeded 21 days, the spell was split across the two sites (e.g. if MTC & TU - both received a count).

4. Hospital spells in non-district general hospital settings were excluded as it was assumed that patient flow would not change significantly for this cohort. These numbers were neglible.

5. The average change in flow across the English Trauma Networks has been applied equally to all Welsh hospitals, irrespective of there being some geographical and epidemiological variation between regions. In reality the proportion of direct transfers to the MTC will be higher the closer the patient is the MTC.

6. The change in flow has been modelled on the basis that the location of the 'candidate' TU's is as agreed. Further analysis has been undertaken by the Hywel Dda trauma task and finish group, based on the version 7 approved dataset, to inform local changes in patient flow based on the assumption that Glangwilli General Hospital will be the interim 'candidate' trauma unit for planning purposes (in anticipation of a new hospital being built in the Health Board). Thus, for the purposes of further analysis, Withybush Hospital and Bronglais General Hospital are assumed to be LEH's.

7. Princess of Wales Hospital will be the nearest 'candidate' TU to Royal Glamorgan Hospital. CT Health Board and C&V Health Board will need to confirm their position on the latter to agree any variance against this rule.

8. In addition to using the change in flow for the English Trauma Networks, further modelling was undertaken based on head injuries and patients >70 years of age, assuming that for major trauma patients that remain in a TU, 60% have a head injury and 60% are >70 years of age (Source: Moran C, London Trauma Conference, 2018). No other modelling was undertaken against any other parameters (e.g. length of stay, case mix etc.).

9. Whilst the proportional change used is based on cases reported to TARN, the analyses has been applied to hospitals spells.

10. There is significant variation in the standard of clinical coding across the Health Boards, which may impact on the above analysis.

Figure 6: Assumed current position and predicted activity UHW (presented as median hospital spells where hospital is first receiver) for moderate (ISS 9-15), major (ISS >15) and 'candidate' (ISS >9) major trauma

ISS 9-15 – moderate	**Assumed current position**	**Year 1**	**Year 2**	**Year 3**
Direct to MTC	154	206	231	256
Transfer TU to MTC	11	58	58	66
% TU only	660	561	536	503
Total	825	825	825	825
ISS >15 – major	**Assumed current position**	**Year 1**	**Year 2**	**Year 3**
Direct to MTC	284	306	341	368
Transfer TU to MTC	49	219	219	193
% TU only	542	350	315	314
Total	875	875	875	875
ISS >9 – candidate	**Assumed current position**	**Year 1**	**Year 2**	**Year 3**
Direct to MTC	438	512	572	624

Transfer TU to MTC	60	277	277	259
% TU only	1202	911	851	817
Total	**1,700**	**1,700**	**1,700**	**1,700**
Combined Direct to MTC & Transfer TU to MTC	**498**	**789**	**849**	**883**

Figure 7: Assumed current position and predicted activity all other hospitals (presented as median hospital spells where hospital is first receiver) for 'candidate' (ISS >9) major trauma

Original Hospital	Current Assumed Position	Change in flow Year 1	Change in flowYear 2	Change in flow Year 3
Morriston (total spells)	**318**	**318**	**318**	**318**
Stays at current	308	225	203	201
Transfer TU to MTC	10	76	74	68
Direct to MTC		17	41	49
Glangwilli (total spells)	**107**	**107**	**107**	**107**
Stays at current	107	72	82	69
Transfer TU to MTC		25	15	17
Direct to MTC		10	10	21
NHH (total spells)	**134**	**134**	**134**	**134**
Stays at current	132	111	98	90
Transfer TU to MTC	2	15	20	15
Direct to MTC		8	16	29
PCH (total spells)	**133**	**133**	**133**	**133**
Stays at current	130	92	84	84
Transfer to MTC	3	32	33	27
Direct to MTC		9	16	22
POW (total spells)	**118**	**118**	**118**	**118**
Stays at current	116	94	79	81
Transfer TU to MTC	2	18	22	16
Direct to MTC		6	17	21
Royal Gwent (total spells)	**159**	**159**	**159**	**159**
Stays at current	157	119	114	99
Transfer TU to MTC	2	31	26	34
Direct to MTC		9	19	26
Royal Glam (total spells)	**134**	**134**	**134**	**134**
Stays at current	132	108	98	90
Transfer TU to MTC	2	24	26	21

Direct to MTC		2	10	23
Withybush (total spells)	**103**	**103**	**103**	**103**
Stays at current	100	76	80	69
Transfer TU to MTC	3	20	16	17
Direct to MTC		7	7	17
Bronglais (total spells)	**56**	**56**	**56**	**56**
Stays at current	56	40	38	39
Transfer TU to MTC		14	11	6
Direct to MTC		2	7	11

By providing a breakdown of hospital spells by the 'patient pathway' visualisation is provided of the extent of the potential duplicated hospital spells per patient.

As part of the analysis, an attempt was made to use a previously developed pre-hospital triage tool and how this could be retrospectively applied to a small sample of WAST Patient Care Record data (obtained through NWIS), to determine how flow might change. This analysis did not generate meaningful results and has not been carried forward to inform planning assumptions.

However, the data provided in Figure 7 can be used by WAST to understand the potential increase in the number of ambulance journey's (both by direct transfer to the MTC or transfer from TU to MTC) to inform planning assumptions.

Figure 8: Modelled current and predicted bed occupancy (LOS ≥3days)

	Beds Occupied - Current			**Year 1**			**Year 2**			**Year 3**		
	5%ile	50%ile	95%ile*	5%ile	50%ile	95%ile	5%ile	50%ile	95%ile	5%ile	50%ile	95%ile
University Hospital Of Wales	23	30	38	42	47	53	45	50	56	46	52	58
Morriston Hospital	7	13	19	8	10	12	7	10	12	7	10	12
Glangwilli General Hospital	4	7	11	8	11	13	8	10	12	7	10	12
Nevill Hall Hospital	2	6	10	3	5	6	3	5	6	3	4	6
Prince Charles Hospital	2	5	9	2	4	5	2	3	5	2	3	5
Princess Of Wales Hospital	4	7	11	7	9	11	7	9	11	6	9	11
Royal Gwent Hospital	4	8	13	4	6	8	4	6	8	4	6	7
The Royal Glamorgan Hospital	2	5	10	0	0	1	0	0	1	0	0	1
Withybush General Hospital	2	4	8	0	0	1	0	1	1	0	1	1
Bronglais General Hospital	1	3	6	0	0	1	0	0	1	0	0	1

*95%ile is equivalent to 80% bed occupancy threshold

Modelled current and predicted bed occupancy – Level 2 and Level 3 beds

Due to the inconsistencies in collating ITU bed day data across Wales it is recognised individual Health Board level interrogation of Ward Watcher may provide more meaningful data to predict bed occupancy. However, it is anticipated that the only unit requiring additionality following regionalisation will be UHW.

Figure 9: Assumed current position and predicted activity UHW (presented as median hospital spells where hospital is first receiver) for moderate (ISS 9-15) and major (ISS >15) – under 16 years of age (paediatric population)

	Assumed current position	Year 1	Year 2	Year 3
ISS 9-15	22	27	30	33
ISS >15	53	55	56	60

KEY ASSUMPTION(S)

1. That paediatric cases follow the same proportional change observed across the dataset illustrated in Figure 5.

Modelled predicted flow from MTC to the 'landing pad' ('Care with Treatment Closer to Home').

1. Experience demonstrates that currently few patients are being repatriated in a timely manner from specialist centres. Most either go home or on to specialist rehabilitation form the specialist centre. Furthermore, TARN do not record a transfer unless the patient is undergoing surgery in the receiving unit. Length of stay (LoS) data is equally challenging, as there is significant variation according to the clinical issues and across health boards (given differences in community rehabilitation and access to social care). This has introduced an added challenge to quantify these flows.

2. In order to address this issue the following additional work has been undertaken:

    - UHW TARN data (Apr – Sept 2018, 6mths data) taken with a break down by resident postcode. Excellent case ascertainment (>90%) recorded during this time.
    - Used this data to quantify origin Health Board numbers. An estimation provided based on 28% population split due to Health Board boundary change in April 2019 (between formally ABMU and CTU Health Boards).
    - Figure doubled to give an estimate of annual cases broken down by origin Health Board.
    - Figure 7 in attached data paper used to estimate additional flow to UHW broken down by origin Health Board (year 1 figures used).
    - Powys Teaching Health Board data added to CTM UHB – small numbers.
    - UHW 12mth baseline data added to additional flows to MTC to give total flows to MTC (incl. baseline and additional cases).

- Using data below from the Southmead Trauma Centre, Bristol on flow of patients – calculated minimum (20%) and maximum (34%) return to origin Health Board. For the maximum return broken down by subgroups:

Whilst the rehabilitation model and epidemiology may be slightly different, discharge data from the Southmead Trauma Centre, Bristol, gives an idea of the disposition of adult (16 years or over) patients who leave the MTC, in order to assess the number of patients returning to each Health Board and impact of 'care closer to home.'

	%
Rehabilitation	14 (6.4% specialist rehabilitation requirements
Other acute hospital	20
Home (own)	52
Home (relative or other carer)	4
Mortuary	7
Nursing home	3

Rehabilitation – specialist rehabilitation and acute rehabilitation – 14% (approx. half require complex rehabilitation – neuro/spines)
Other acute hospitals – ongoing medical care and/or physio/OT/discharge planning - 20%

LHB of patient	TARN UHW (6mth baseline data)	UHW (12mth baseline data)	Additional flows to MTC (from Figure 7)	Total flows to MTC (baseline and additional)	Total flows back (assuming 20% return)	Total flows back (assuming 34% return)
SBUHB	25	50	93	143	29	49
ABUHB	44	88	73	161	32	55
C&VUHB	226	452	N/A	N/A	90	154
CTMUHB	36	72	105 + 16 = 121	193	39	66
HDUHB	29	58	78	136	27	46
PTHB	8	16	Added to CTM figures	N/A	N/A	N/A

LHB of patient	Total flow back (assuming 34% return)		
	Ongoing medical care and/or physio/OT /discharge planning	Level 2 rehabilitation	Awaiting specialist rehabilitation (neuro/spinal)
SBUHB	29	11	9
ABUHB	33	13	9
C&VUHB	92	35	27
CTMUHB	40	15	11
HDUHB	28	10	8

3. Based on this, minimum and maximum flow backs to the origin Health Board are still less than additional flows to MTC (except in LHB's where TU configuration dictates), therefore these numbers to do not represent increasing capacity within the origin Health Board, but are to be used to determine bed requirements in any given area. The actual number returning is likely to sit somewhere between the minimum and maximum returns.
4. From the C&V UHB TARN dataset the body regions with most severe injury were as follows to help understand the type of patients that might be received back:

Most severely injured body region	Total
Abdo	3.1%
Chest	16.7%
Face	1.3%
Head	33.1%
Limbs	20.3%
Multiple	13.1%
Other	0.8%
Spine	11.8%
Grand Total	**100.0%**

5. LoS data is difficult to quantify for these patients, however, experience gained for English trauma networks has informed an estimation based on actual flow. The average LoS to be used for planning assumptions is 6 weeks per patient. This has been used to calculate the following 80% equivalent bed occupancy based on a 34% return:

LHB of patient	Bed occupancy
SBUHB	7
ABUHB	8 (initially split across 2 TU's)
C&VUHB	20
CTMUHB	10 (split across 2 TU's)
HDUHB	7
PTHB	N/A

6. It should be noted critical care transfers from the MTC to TU's are limited. It also recognised that it is difficult from the dataset to calculate the percentage of patients who will require a non-medical vs. a medical escort for transfer.

ASSUMPTIONS

1. That the assumed number of trauma patients seen at UHW in 6mths will be double for that seen in 12mths. It is also assumes that the UHW data is representative of annual data from the Health Board in terms of patient mix.
2. That the pattern of return for patients to the origin Health Boards mirrors that of the Severn Trauma Network. However, this is likely to be accurate given discussions with other networks.

3. That currently no trauma patients are repatriated to the origin Health Board hospitals, which is unlikely to be the case.
4. Those South Powys patients who require ongoing in-hospital care will return to CTUHB – numbers small.
5. Does not account of LoS variation between Health Boards and patient groups.

Modelled Predicted Patient Flows - Hywel Dda (provided by Stuart Gill)

Subsequent to version 8.0, the approved dataset was used to carry out further analysis by the Hywel Dda trauma task and finish group, to inform local changes in patient flow based on the assumption that Glangwilli General Hospital will be the interim 'candidate' trauma unit for planning purposes (in anticipation of a new hospital being built in the Health Board). Thus, for the purposes of further analysis, Withybush Hospital and Bronglais General Hospital are assumed to be LEH's. This dataset has been approved locally to inform planning assumptions and summarised in the Health Board up date to the Network Board on the 18th March 2019.

Bronglais General Hospital TARN data was been used as this provided the fullest data set with 150% predicted case ascertainment for the year 2017-2018. A draft pre-hospital triage tool was applied to this dataset.

This analysis was then used to generate estimates of patients for transfer and destination:

1. Conservative estimate – only including Definite and Probable.
2. Maximum estimate – including Definite, Probable and Possible.

A further assessment based on likely destination was made:

1. Conservative estimate TU admissions – Cases in the above conservative estimate confidently predicted to need TU care.
2. Maximum estimate TU admissions- Cases in the above maximum estimate, where predicted destination was TU or equivocal (MTC/TU or LEH/TU).

Predicted destination upon transfer

Predicted Destination	Number of cases	% of total (97)
MTC	27	28%
TU	14	14%
MTC/TU	13	13%
LEH/TU	10	10%

Predicted maximum/minimum to TU

	Number of cases	% of total (97)
Transfer to TU Max	37	38%
Transfer to TU conservative	13	13%

Predicted flow of patients into GGH in the event of GGH being the only TU for Hywel Dda

GGH as Candidate TU

Year	1	2	3
Network data, predicted to remain (current admissions)	72	82	69
Maximum increase	73	75	70
Minimum increase	23	23	22
Total max	145	157	139
Total min	95	105	91

The maximum increase constitutes approximately 6 additional patients per month or 1-2 per week being admitted to the TU (0.4 -1.44/week).

In addition, an analysis was performed on the remaining minor trauma cases (ISS<9) that were admitted to Bronglais comprising 32 cases with the highest ISS being 8, one ISS 5 and the remainder being 4. Only TARN injury descriptors were used as part of the analysis, WCP/PAS were not interrogated.

This revealed an additional 9 patients (in the year 2017-2018) who, due to injury pattern may have been triaged to the TU by the ambulance service. This was done to illustrate a potential "worst case scenario" of volumes of patients being taken to the TU.

"Worst case scenario"

Highest possible volumes	Year 1	Year 2	Year 3
Increase	82	84	79
Total cases	154	166	195

The worst-case scenario gives a similar increase in terms of admissions per week. (1.5 – 1.6).

This dataset was used to inform planning assumptions for Glangwilli General Hospital and WAST within the Health Board.

RECOMMENDATIONS

The Network Board are:

1. Asked to note the summary of the methodology/key assumptions and approve the use of the modelling in relation to repatriation to inform capacity planning for the 'landing pad.'

REFERENCE(S)

Moran *et al* (2018). Changing the system – Major Trauma Patients and their outcomes in the NHS (England) 2008-17. *The Lancet*, Vol 2, p13-21.

ACKNOWLEDGEMENTS

Acknowledgments to the significant contributions of Gareth John and Andrew Nelson in undertaking the above detailed analyses.

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