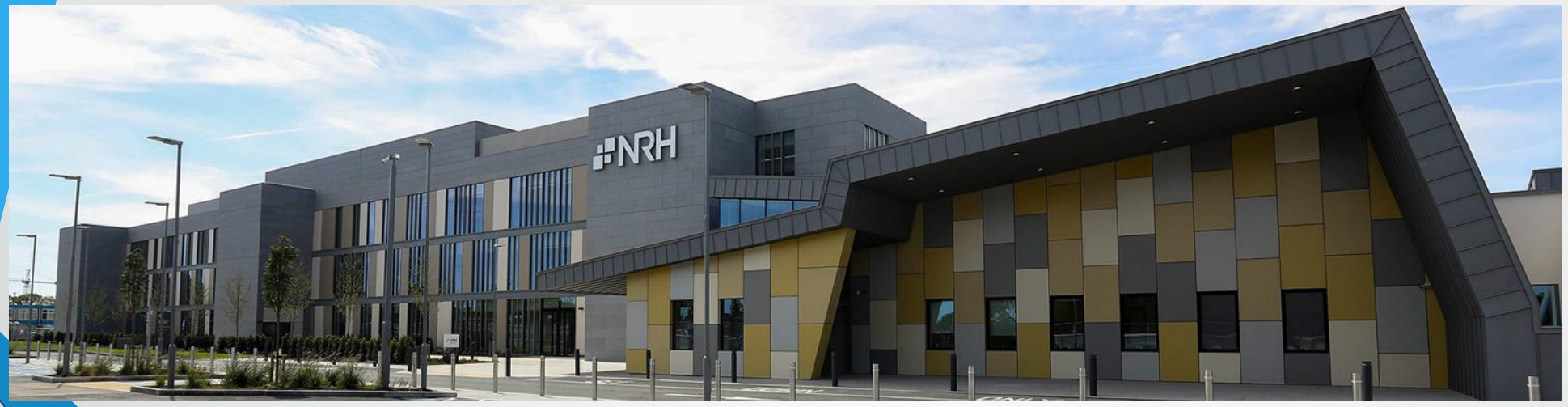
RSA annual Academic Lecture



Implementation of Road Safety Strategy in Ireland, a Serious Injury & Rehabilitation Perspective

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Introduction

- Globally, road traffic collisions (RTCs) are a leading cause of death and serious injury with 1.35 million people dying each year and 20-50 million surviving with serious injury and disability
- Despite overwhelming evidence of the devastating health and socio-economic consequences of RTCs, until recently their impact has been neglected in government service and policy particularly in low- and middle-income countries.
- There has been a significant change in the road safety landscape in Ireland over the last 25 years. In 1998, the first government strategy for road safety was published followed by the establishment of the Road Safety Authority in 2006 as a statutory organization created by the Road Safety Authority Act, 2006 with the aim to reduce collisions, deaths and injuries.
- From 2012 and 2019 Ireland has improved from fifth lowest to second lowest country for road fatalities per million population within the EU-28. Awarded the prestigious ETSC Road Safety Performance Index (PIN) Award in 2019 in recognition of this. 136 road deaths in 2021 (provisional).

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- Reduce the number of deaths and serious injuries on Irish roads by 50% over the next 10 years.
- This means reducing deaths on Ireland's roads annually from 144 to 72 or lower and reducing serious injuries from 1,259 to 630 or lower by 2030.
- The first step in achieving the 2020 Programme for Government commitment of bringing Ireland to 'Vision Zero' - to eliminate all road deaths and serious injuries on Irish roads by the year 2050.

- Another development has been the National Office of Clinical Audit (NOCA) implementation of the Major Trauma Audit (MTA) in Ireland.
- Data collection commenced in 2013 and most trauma receiving hospitals submit trauma data.
- However, although the UK TARN dataset has been linked to the UK Rehabilitation Outcomes Collaborative (UKROC) dataset, in the National Clinical Audit of Specialist Rehabilitation following Major Injury (NCASRI), Ireland thus far does not have a Rehabilitation Outcomes Collaborative and therefore very little information is available about the rehabilitation needs of patients leaving the trauma receiving hospitals or how well these needs are being met.
- There are also other sources of trauma and road traffic related data in Ireland include the Irish Hip Fracture Database, The Irish LongituDinal Study on Ageing (TILDA), the Road Safety Authority (RSA), the Health and Safety Authority (HSA), the Central Statistics Office (CSO) and the Hospital Inpatient Enquiry (HIPE) system etc. so the data landscape is complex.

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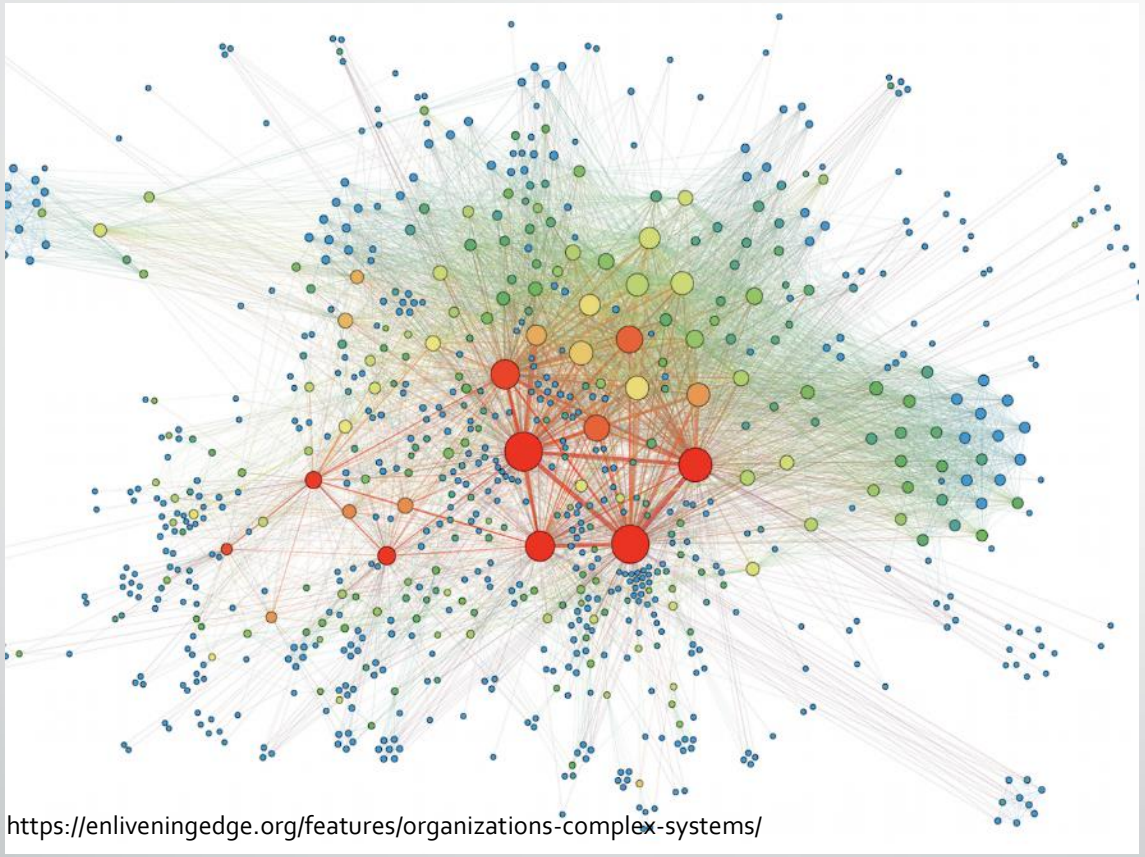

https://enliveningedge.org/features/organizations-complex-systems/

- The trauma landscape is complex
- The Data landscape is just as complex!

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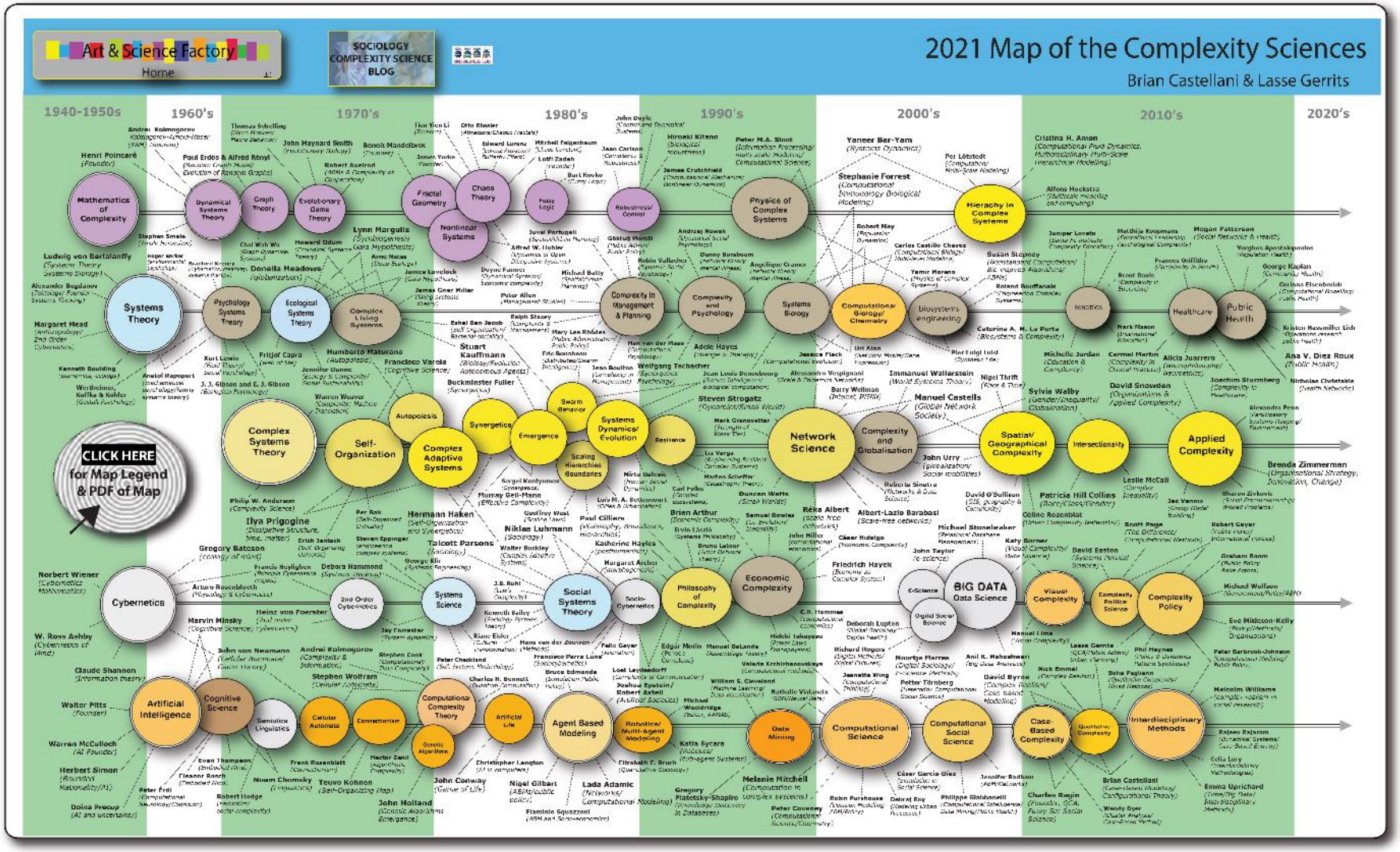
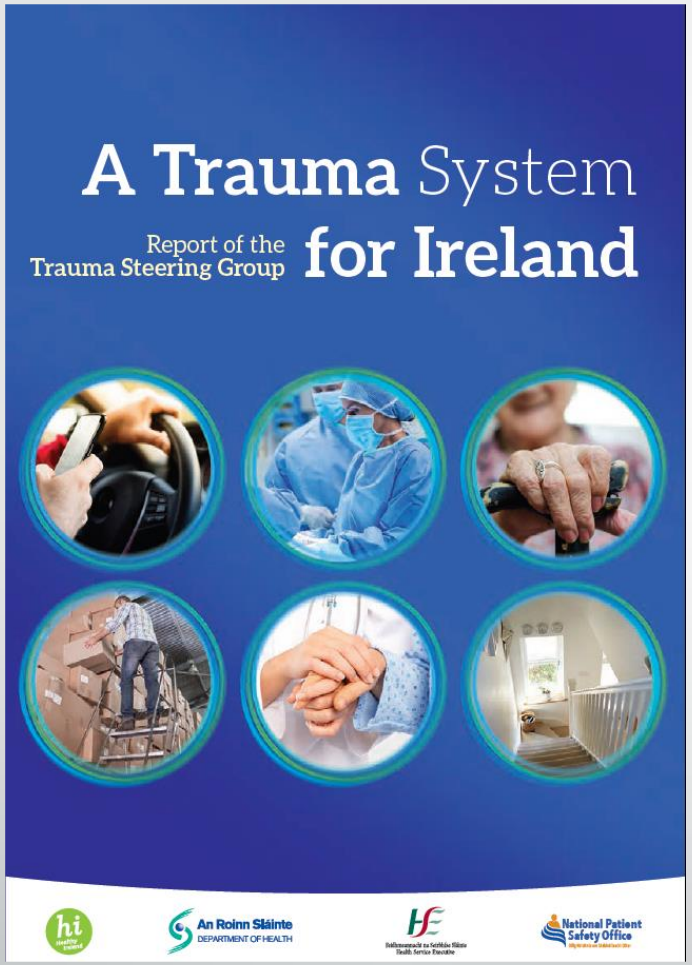


Underlying features of a Complex Adaptive System	Trauma ecosystem
• **Constituted relationally**	✓
• **Adaptive capacities**	✓
• **Dynamic processes**	✓
• **Radically open**	✓
• **Contextually determined**	✓
• **Novel qualities emerge through complex causality**	✓

Carroll, Á., 2021. The Irish healthcare system as a complex adaptive system. Ir Med J, 114, p.332.



- In addition, with the implementation of the 2018 A Trauma System for Ireland: Report of the Trauma Steering Group, access to data across the continuum of care will be required to ensure the needs of all trauma patents are being met.

- Also, if 15-20% ↑ survival, demand for rehabilitation will ↑

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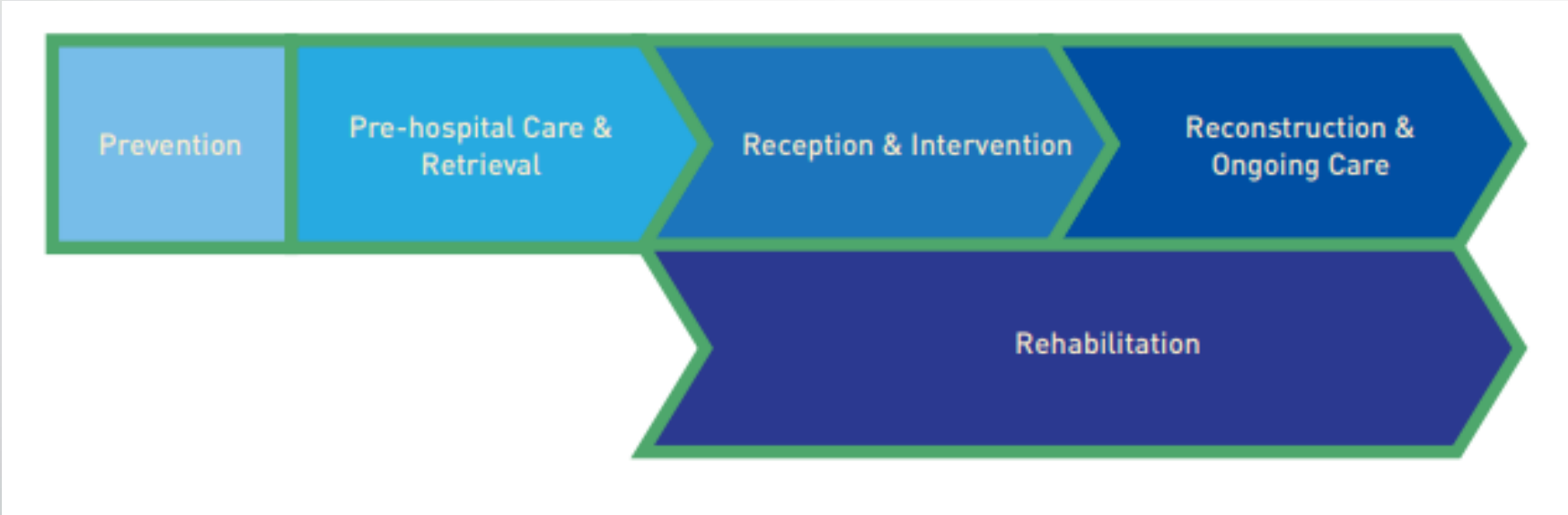

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THE 9 PILLARS

1. Shared values and vision

2. Population health and local context

3. People as partners in care

4. Resilient communities and new alliances

5. Workforce capacity and capability

6. System wide governance and leadership

7. Digital solutions

8. Aligned payment systems

9. Transparency of progress, results & impact

Nick Goodwin former CEO IFIC

"the role of information, communication and technology is commonly regarded as one of the essential ingredients in enabling the success of integrated care. It has the most uncommon dual property in this regard. It is simultaneously the grease that allows integrated care systems to operate as smoothly as they can through good communication of information between care professionals and services users, but it is also the glue that binds care systems together".

https://www.ijic.org/articles/10.5334/ijic.4638/

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Literature review

- There have been several recent systematic reviews and meta-analysis exploring the impact of trauma systems on injury outcomes.
- Most studies looked at mortality as the primary outcome measure.
- These reviews recommend that further research is required to properly evaluate the different components of trauma systems and non-fatal outcomes and explore the impact of system component interactions.
- Although there are many publications/empirical studies that look at the impact of elements of road safety strategy there were none that evaluated implementation of road safety strategy as a complex intervention in a complex system and most publications agreed on the need for further research exploring long term and patient-centered outcomes

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In the absence of an Irish Rehabilitation Outcomes Collaborative, we decided to undertake a review to see if the presentations to the National Rehabilitation University Hospital (NRH) of road traffic trauma related injury had changed with the research question; how have admissions with road traffic related injuries changed over the last 5 years?

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Aims and Objectives:

- Aim
  - To investigate the types of injury sustained in Road traffic collisions in patients admitted to a National Rehabilitation University Hospital (NRH) over a 5 -year period from 2014-2018.
- Objectives
  - Identify the types of road traffic collision related injury
  - Determine if numbers of admissions have changed over time
  - Determine if the numbers reflect road safety/trauma strategy

Setting and context

- The National Rehabilitation University Hospital (NRH) is the only hospital in the Republic of Ireland to provide Complex Specialist Rehabilitation services to patients who have a complex acquired disability because of an accident, illness, or injury.
- Specialist rehabilitation is the total active care of patients with complex disabilities by a multiprofessional team who have undergone recognized specialist training in rehabilitation, led /supported by a consultant trained and accredited in rehabilitation medicine.
- The NRH serves the national population of 5 million.
- Rehabilitation Programmes are tailored to meet the individual needs of adult and paediatric patients in the following areas of specialty:
  - Acquired Brain Injury (including, traumatic, non-traumatic brain injury and other neurological conditions)
  - Stroke Specialty Programme
  - Spinal Cord System of Care (including, traumatic, non-traumatic spinal cord injury)
  - Prosthetic, Orthotic and Limb Absence Rehabilitation (POLAR) and
  - Paediatric Family-Centred Rehabilitation.
- It is fully publicly funded and is a tertiary referral hospital.
- It is accredited by the Commission for Accreditation of Rehabilitation Facilities.
- A broad range of data is recorded on admission and discharge, but the national data standard is Hospital In-Patient Enquiry (HIPE). HIPE is the principal source of national data on discharges from acute hospitals in Ireland and uses the Clinical coding scheme the International Classification of Diseases (ICD) 10.

- Methods:
  - A retrospective review of healthcare records
  - All patients discharged from the in-patient rehabilitation service with an ICD 10 coded diagnosis of Transport accidents (V00 – V89.9) (Transport accident-related injury) from 2014-2018 were included
- Data sources
  - NRH interdisciplinary healthcare record
- Data extraction:
  - The healthcare record review was performed in accordance with recommended best practice for the performance of retrospective chart review and medical record abstraction
- Data analysis:
  - Data analysis was conducted using statistical software package SPSS version 27. Chi square test was used to determine whether there was any association between in-jury type and demographics of the patients

- Convenience sampling was used with all cases selected over a defined time period.
- A simple coding manual was created. We adopted “9” as the universal code for missing data as recommended by the Health Services Executive Healthcare Audit Criteria and Guidance.
- Inclusion criteria:
  - First admission (unless a subsequent RTC)
  - Admission between January 2014 and December 2018.
- Exclusion criteria;
  - readmissions due to the same RTC,
  - admission date before or after January 2014 and December 2018.
- Specific data gathered included age at presentation; gender; clinical programme (Brain injury programme (BI); spinal cord injury programme (SCI), prosthetic orthotic and limb absence programme (POLAR); level of disability (as measured by the modified Barthel Index), and year of admission.
- In addition, the number of RTC related severe TBI, SCI and traumatic amputations were extracted from the MTA reports 2014-2018.

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Results:

- 338 cases were identified.
- 178 did not meet the inclusion criteria (readmissions) and miscoding (n=1).
- The total number of healthcare records analyzed systematically using a standardized data extraction proforma was 165.

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Figure 1: Number of Admissions

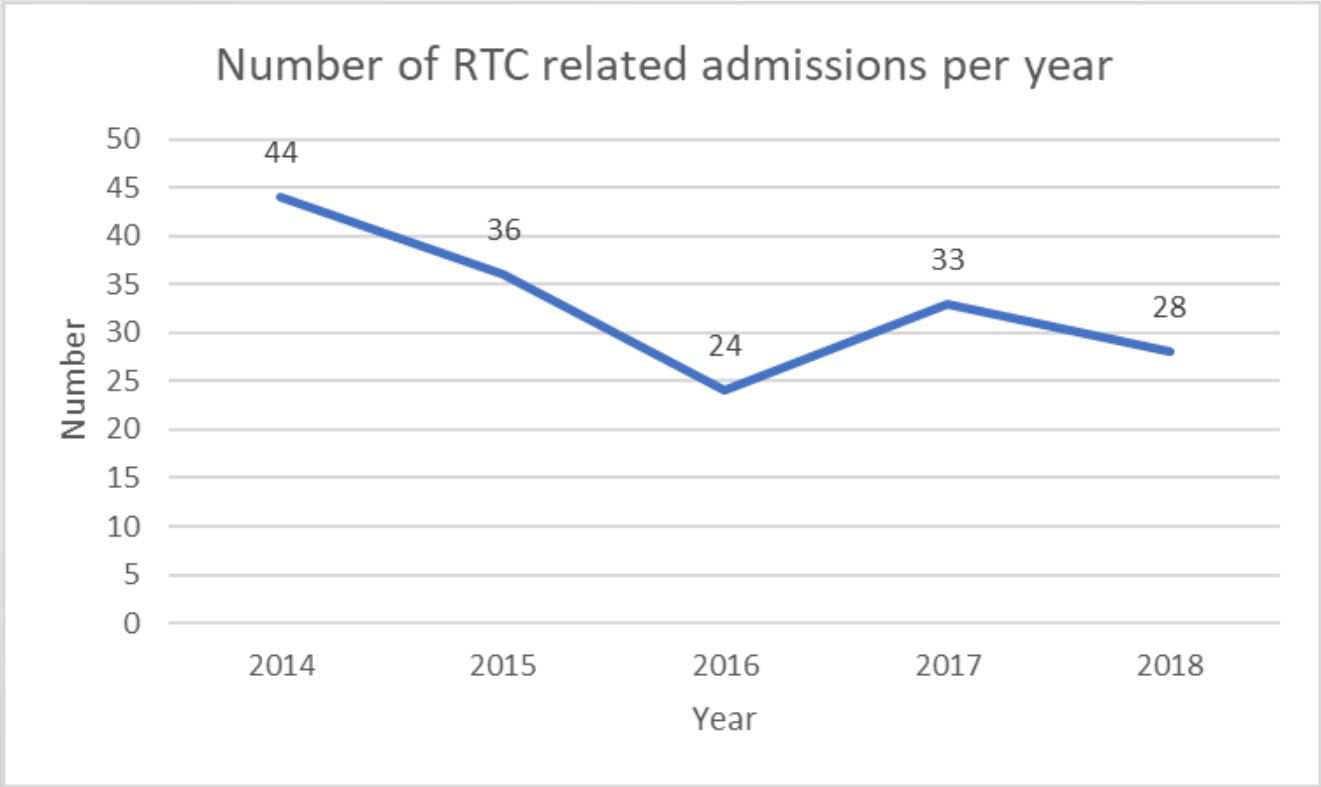

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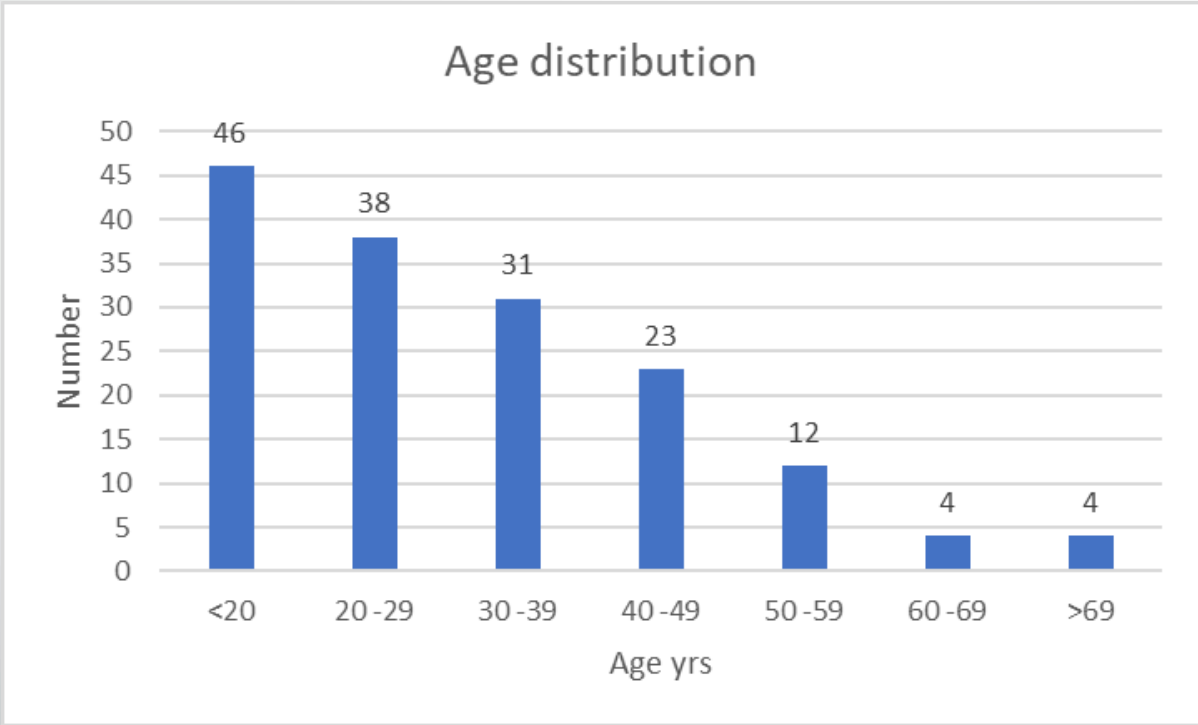
Figure 2: Age



72% were under the age of 40

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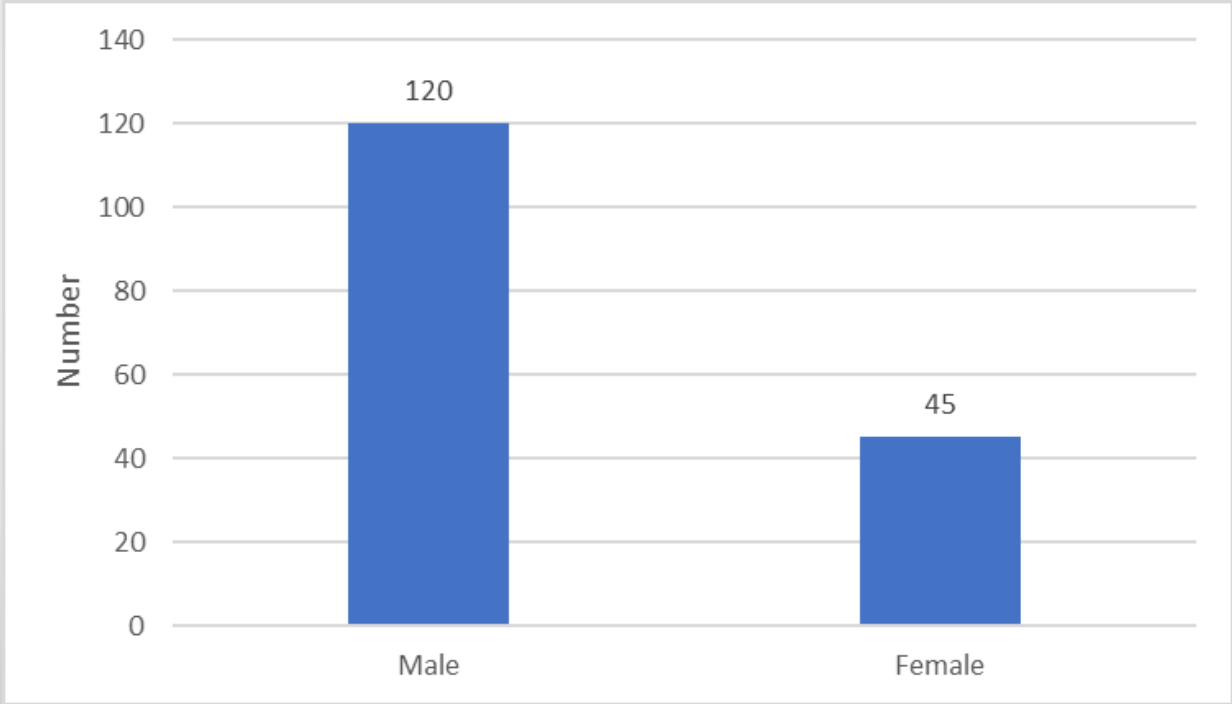
Figure 3: Gender



120 (73%) were male and 45 (27%) were female.

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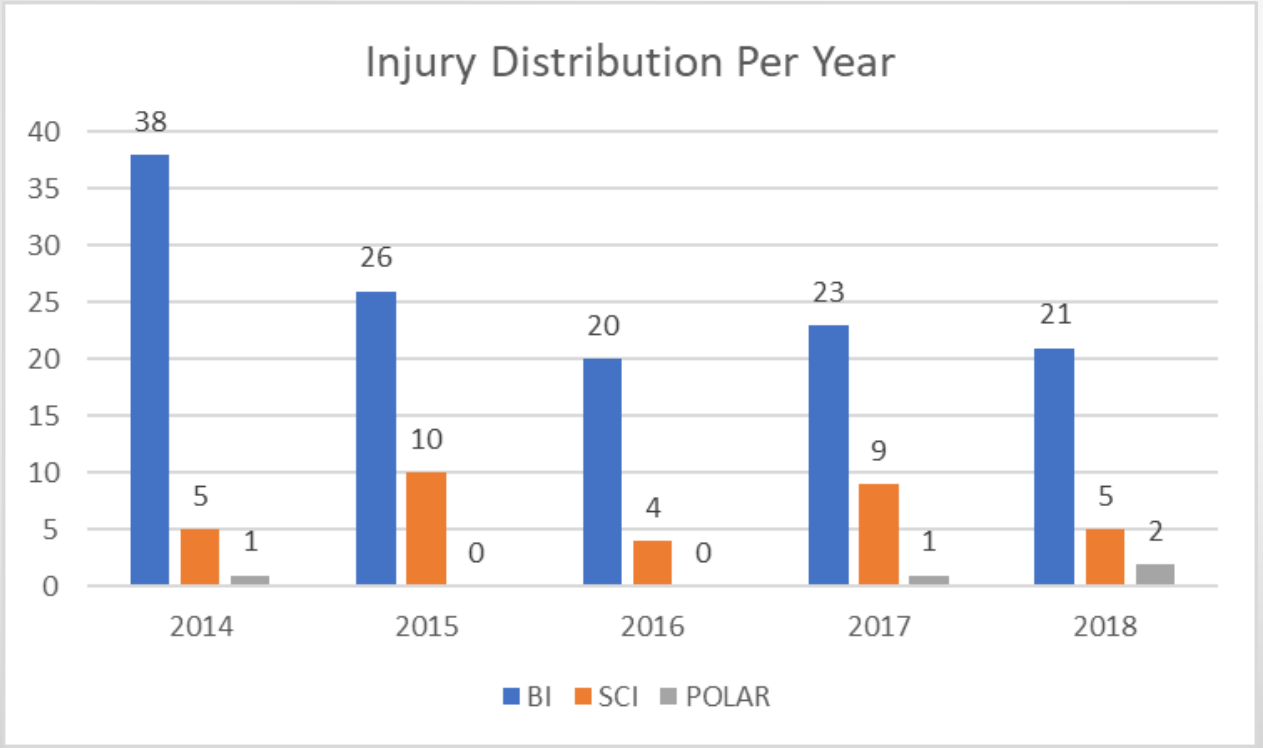
Figure 4: Type of Injury



122 (77%) had traumatic brain injuries, 30 (20%) had traumatic spinal cord injuries and 4 (3%) had traumatic amputation. There were no combined injuries.

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Chi-Squared

- Chi-square test revealed that there was no significant association between injury type and gender categories ($X2 = 1.890$, $p=0.389$). In addition, brain injury was the major injury type for all age categories.
- Also, Chi-square test revealed that there was no significant association between injury type and age categories ($X2 = 9.096$, $p=0.059$).

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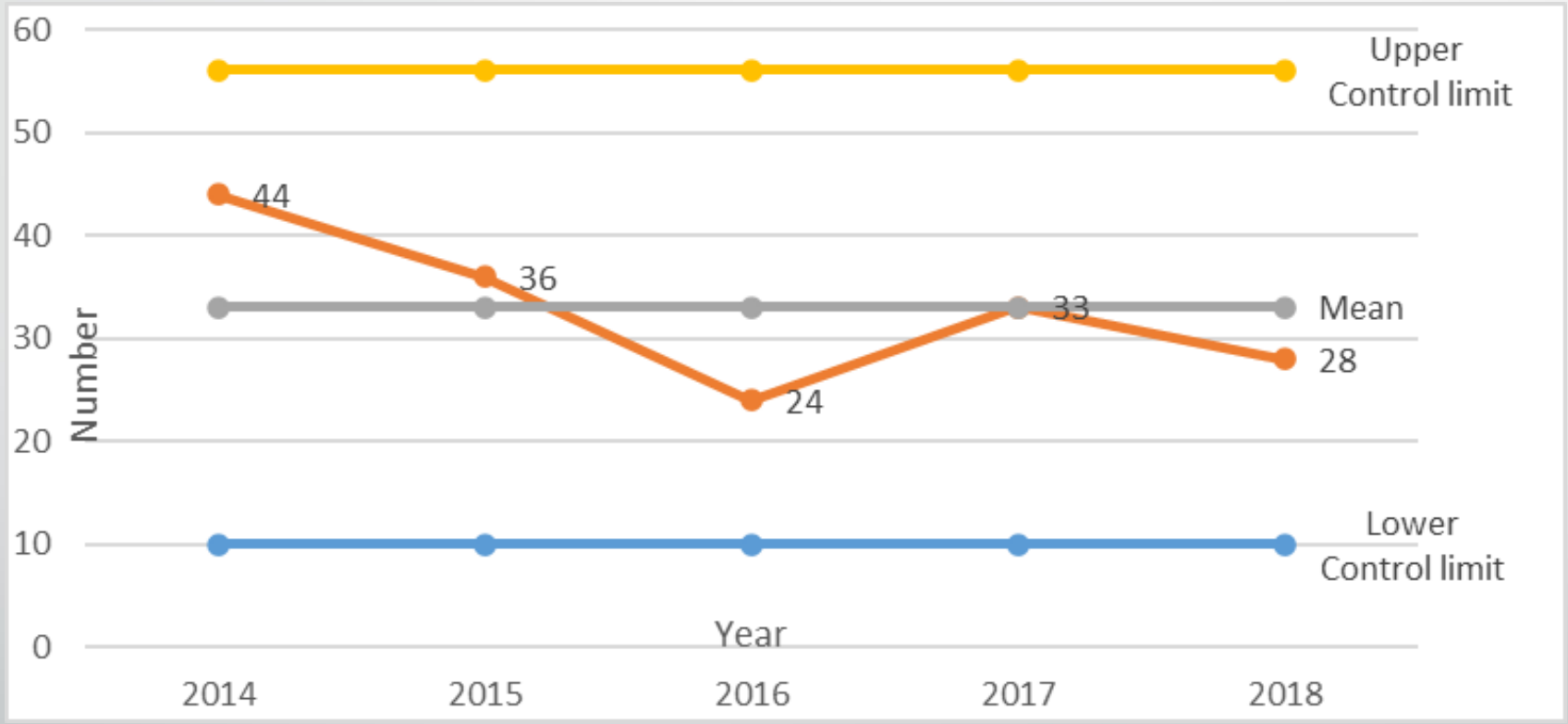
Figure 5: SPC ImR chart



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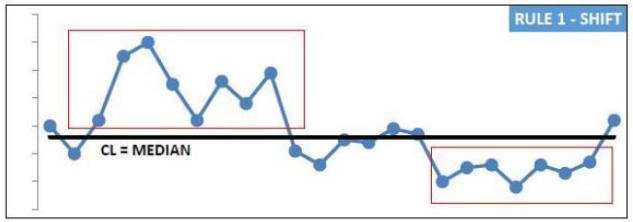
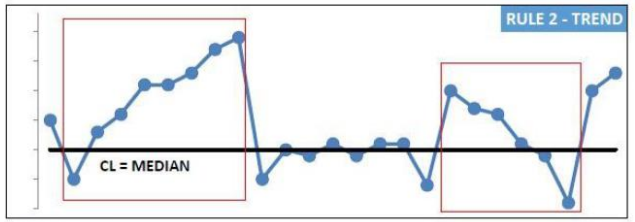
Rules of Non-Random Variation

There are **four rules** for a run chart that help you identify non-random variation.



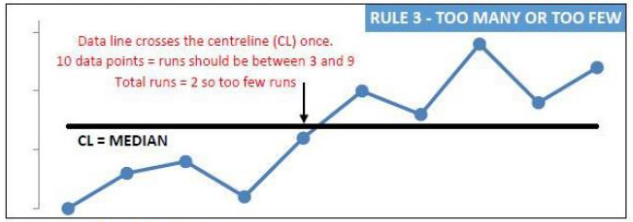
Rule 1 – Shift

Six or more consecutive points either all above or all below the centreline (CL). Values that fall on the CL do not add to nor break a shift. Skip values that fall on the median and continue counting



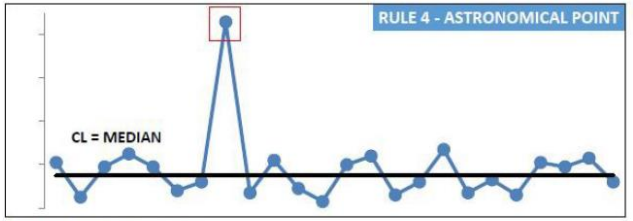
Rule 2 – Trend

Five or more consecutive points all going up or all going down. If the value of two or more successive points is the same (repeats), ignore the like points when counting.



Rule 3 – Too Many or Too Few

If there are too many or too few runs, this is a sign of non-random variation. To see what an appropriate number of runs for a given number of data sets, refer to the table on the next page. An easy way to count the number of runs is to count the number of times the line connecting all the data points crosses the median and add one. If the number of runs you have are:
- Within the range outlined in the table, then you have a random pattern.
- Outside the range outline in the table, then you have a non-random pattern or signal of change.



Rule 4 – Astronomical point

This is a data point that is clearly different from all others. This is a judgement call. Different people looking at the same graph would be expected to recognise the same data point as astronomical.

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Produced by Farid Alom

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https://qi.elft.nhs.uk/wp-content/uploads/2020/03/how-to-use-statistical-process-control-spc-charts.pdf

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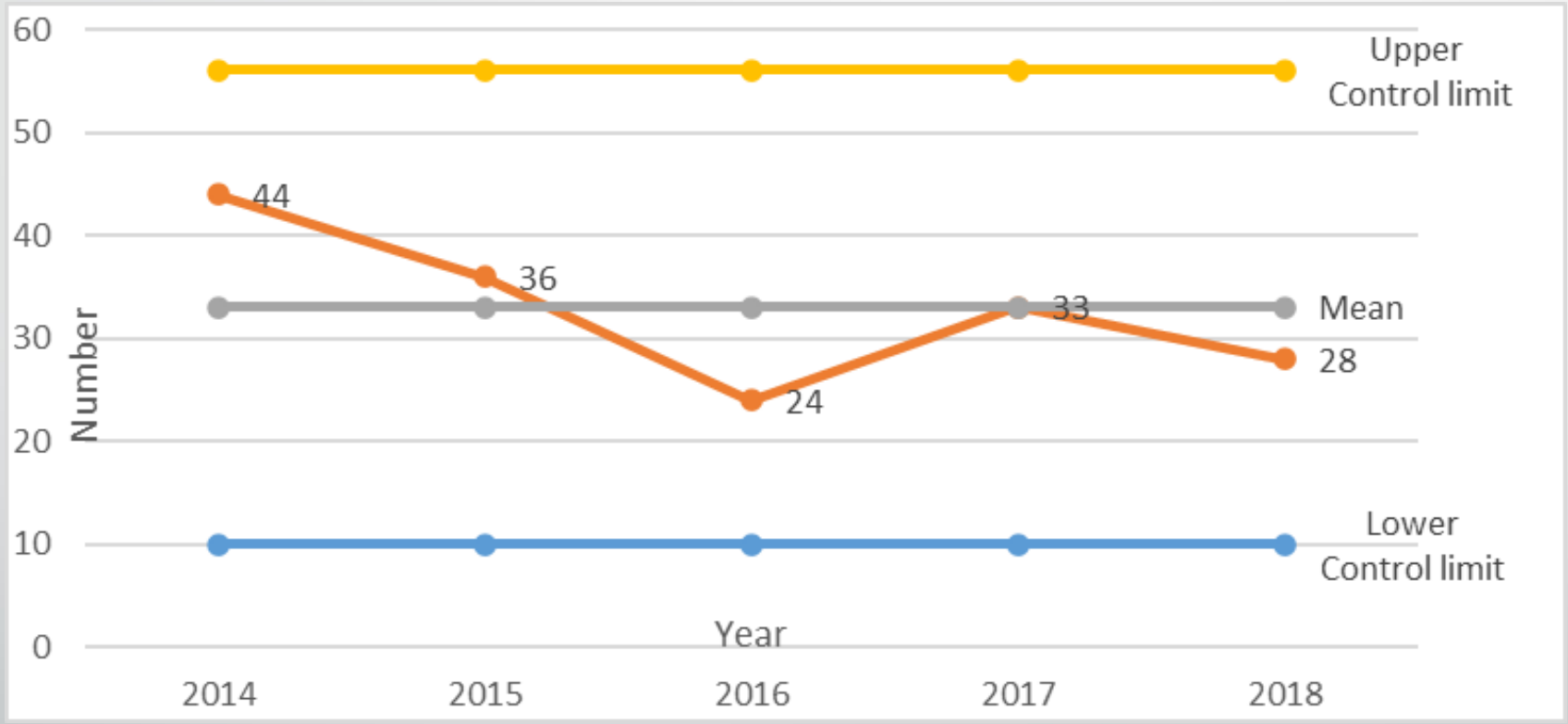
Figure 5: Statistical Process Control chart



Results continued

- All patients with a traumatic brain injury had a moderate to severe acquired disability on admission (Mean MBI 47; range 00-90). The level of disability for the other programmes was incomplete and therefore excluded.
- When the MTA reports were analysed, the reports only detailed RTC related severe TBI (Glasgow Coma Sore <9/8). RTC related Traumatic SCI and amputation numbers were not stated.
- In the 2016 report, the Glasgow outcome scale (a global scale for func-tional outcome) on discharge was reported but did not specifically look at RTC related injury.
- As we could not derive RTC related information from the disability measures, we chose to look at RTC related severe TBI.

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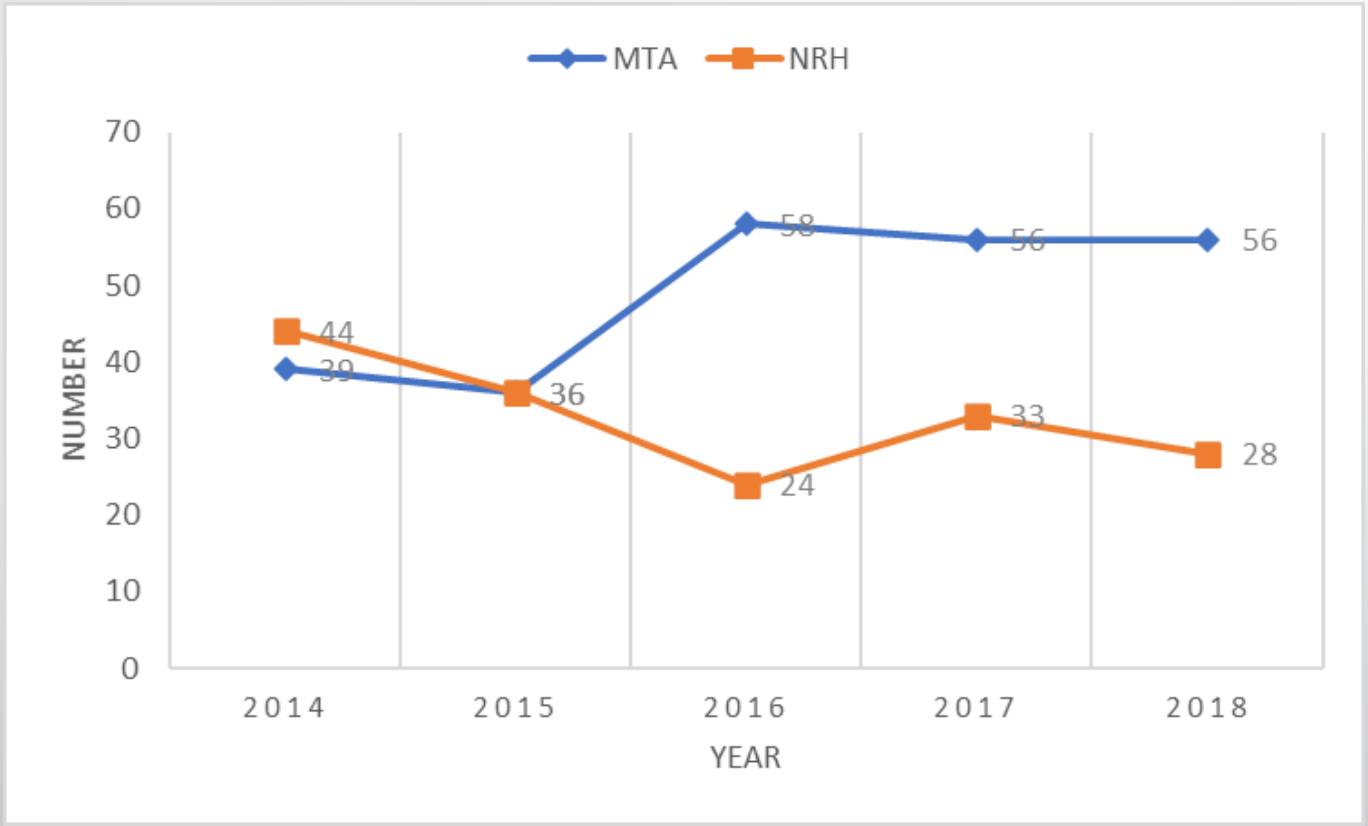
Figure 6: Comparison of NRH (admissions) and MTA (severe TBI) data



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Total discharges from acute hospitals reported to HIPE with any diagnosis from V00 – V89.9 for the years 2014-2018	
Year	**N**
2014	5,410
2015	5,416
2016	5,540
2017	5,544
2018	5,623

With thank to Rory O'Reilly, Data Analytics, Healthcare Pricing Office, HSE

- MTA focuses on the more severely injured trauma patients, those who have potential life changing or life threatening injury. 26/27 trauma receiving hospitals reporting data. Not all data complete.
- Do we agree on a definition of trauma?
- Do we agree on what is a serious injury?
- What is important to all the different stakeholders?
- Long term outcomes

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Summary

- Analysis of the data of inpatient admissions to a complex specialist rehabilitation hospital showed that road traffic collision related injuries were commoner in younger males. This is in keeping with the findings of the MTAs
- The most common injury was traumatic brain injury followed by traumatic spinal cord injury.
- At first glance it would appear that there was an overall reduction in RTC related injuries over the 5 years studied. However, when analysed in a statistical control chart, this was normal variation with no special cause variation.
- However, we only have 5 data points, and it could be that the impact of the implementation of any strategy or policy takes longer before a clear change becomes apparent.
- We therefore plan to prospectively track RTC and trauma related admissions on an annual basis and report back to the trauma lead and the RSA.
- Also, this is a one center study. However, the NRH is the only complex specialist rehabilitation hospital in the country so we should be receiving all trauma cases resulting in complex disability.

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Discussion

- Rehabilitation services are recognised internationally as the “missing link” between hospital and community services but have traditionally been seen as a “nice to have” rather than an essential component of a trauma system of care.
- However, integration of rehabilitation services into the continuum of care within and beyond acute hospitals will accelerate discharge, reduce disability and reduce cost of care.
- As stated in the trauma report, a strong focus on comprehensive, patient-centred rehabilitation services is required, with early assessment of rehabilitation need, as well as enhanced acute, post-acute, regional and community rehabilitation, to enable patients to achieve their maximum functional potential.

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Discussion continued

- Key to an effective trauma system is excellent knowledge mobilisation, enabling research, care management, and performance improvement.
- However, as has been shown by this study, although there are a number of existing databases and information management systems along the trauma pathway, they are fragmented, speak different languages (from a data point of view), and there are significant gaps (particularly from a rehabilitation point of view).
- In order to understand the impact of any road safety strategy or implementation of the trauma report, addressing this fragmentation and plugging these knowledge gaps are essential if we are to successfully evaluate our services across the continuum of care.

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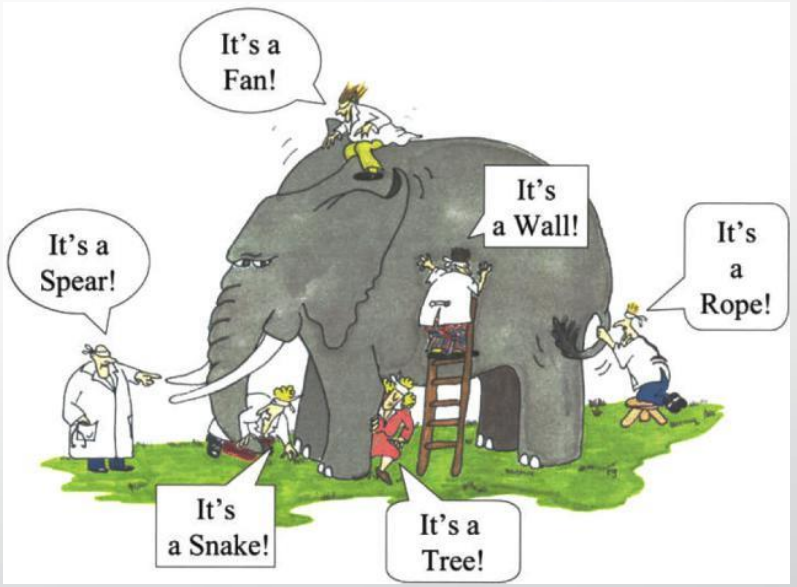
Conclusion

- Ultimately, the evaluation of the success of road safety and trauma policy and strategy will be dependent on the quality of the underlying data that reflects the continuum of care of people surviving with life altering injuries.
- There is much work to be done in making this a reality.
- All agencies and most importantly people affected by road trauma need to agree (and have a shared understanding of) what data should be collected across the continuum of care.
- Data linkage between administrative and health datasets does not currently exist but offers huge potential for understanding the trauma and rehabilitation ecosystem in detail.



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What can/should we do?

- A TILDA for Trauma!
- Invest in the necessary comprehensive datasets across the continuum and long-term outcomes – data needs to tell the story
- Data linkage
- Appropriate analysis methods
- Appropriate expertise (social science, clinical, lived experience, engineering, legal, etc etc) and a partnership approach
- Developmental Evaluation
  - Continuous collection, analysis and feedback
- Application of complexity theory

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I would like to thank Aisling O'Keeffe 2nd year medical student at UCD who did all the data abstraction, Natasha and Shona, data coders at the NRH, Prasanth Sukumar, UCD, for statistical analysis, Michael Kincaid NRH for SPC- without them this work would not have been possible

Thanks also to Dr. Conor Deasy and Louise Brent at NOCA and Rory O'Reilly, Data Analytics, Healthcare Pricing Office (HPO), HSE for their help and information

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Thank you


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