

TBI clinical practice survey

Dr. Sarah Li

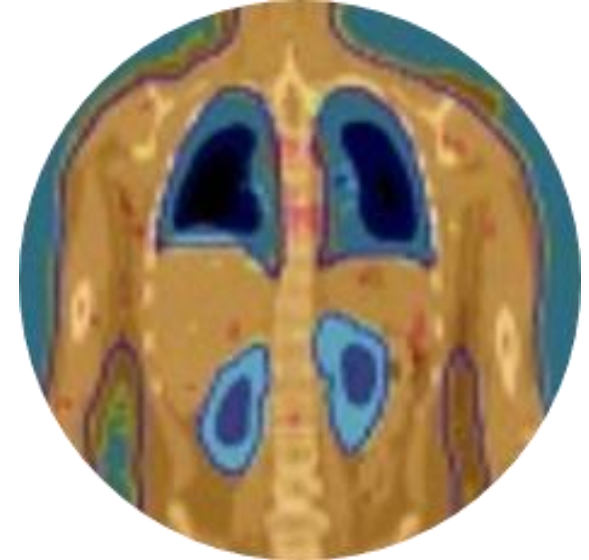


Journal of Medical Imaging and Radiation Oncology

RADIATION ONCOLOGY—ORIGINAL ARTICLE

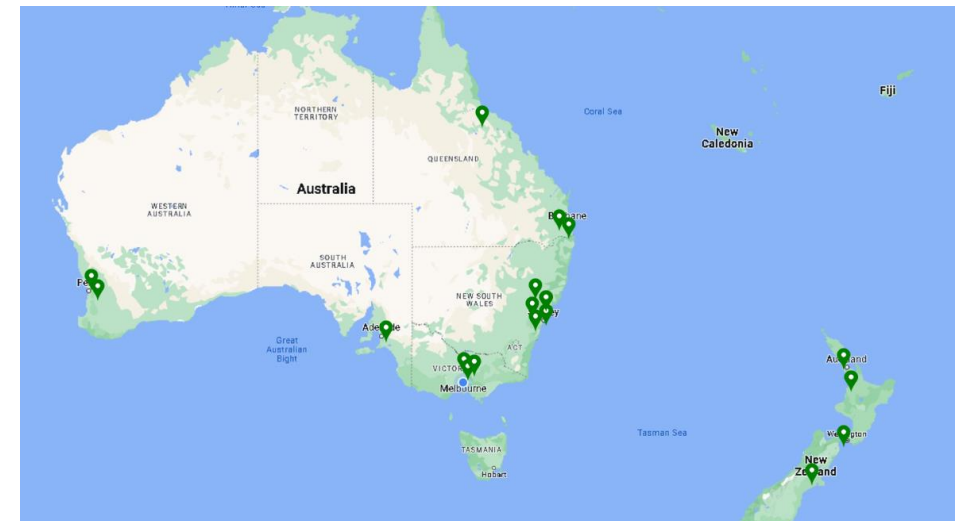
Total Body Irradiation in Australia and A 2024 Practice Survey on Changing Pa

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Total Body Irradiation

- Total Body Irradiation (TBI) can form part of the conditioning regimen for a bone marrow transplant
- TBI is a specialized technique which is delivered in 18 clinics across ANZ
- high-dose (10–13.2 Gy in 6–11 fractions) TBI regimens are employed with aims to kill remaining tumour cells and immunosuppress
- low dose (2–4 Gy in 1–2 fractions) TBI is used in reduced-intensity bone marrow transplants to decrease the complication rate in patients not eligible for or not requiring myeloablative conditioning



Total Body Irradiation

- TBI has the potential to cause significant and potentially fatal side effects
- TBI treatment parameters known to correlate with clinical outcomes include total dose, dose rate, lung dose and fractionation
- organs at risk in TBI include the lungs, kidneys and brain
- 2 techniques:
 - large open fields, delivering a uniform dose to the body
 - modulated techniques enable more accurate sparing of specific organs



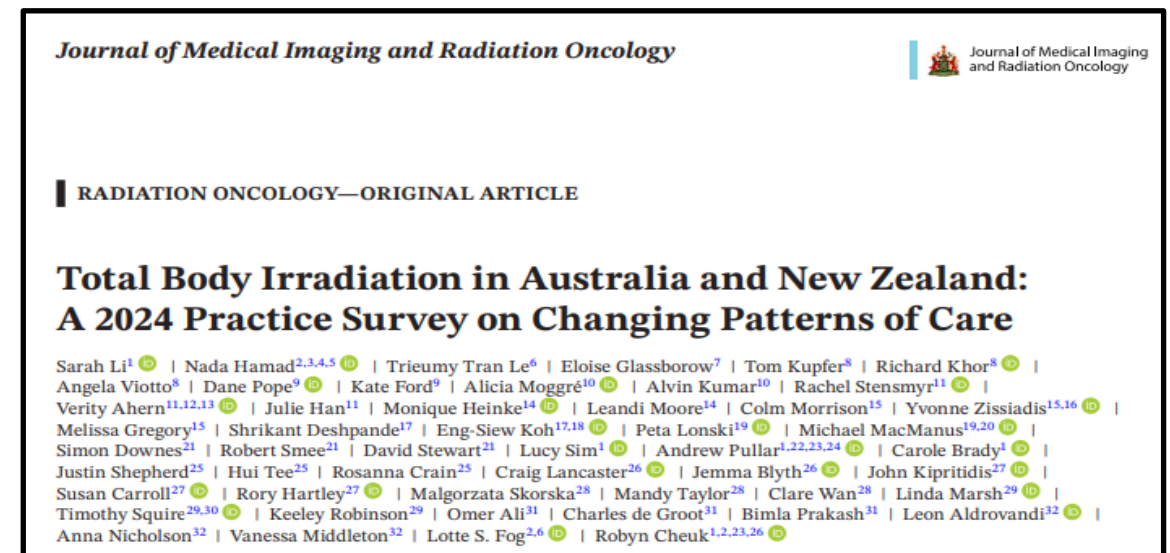
The surveys

2019



Physics driven
Response rate ?

2024



Multidisciplinary contributions
Response rate: 100%

Survey results – patient numbers

- 11 clinics deliver adult TBI only, 3 paediatric only, 3 both
- 2 centres had not yet commenced patient treatment, but plan to treat adult patients only
- on average, centres treat 9 adult patients (range: 2–38) and 6 paediatric patients (range: 2–13) annually with high-dose TBI
- for low-dose TBI, centres treat an average of 8 adult patients (range: 0–20) and 1 paediatric patient (range: 0–2) per year

Some clinics treat low patient numbers



Image from Hoebe 2025

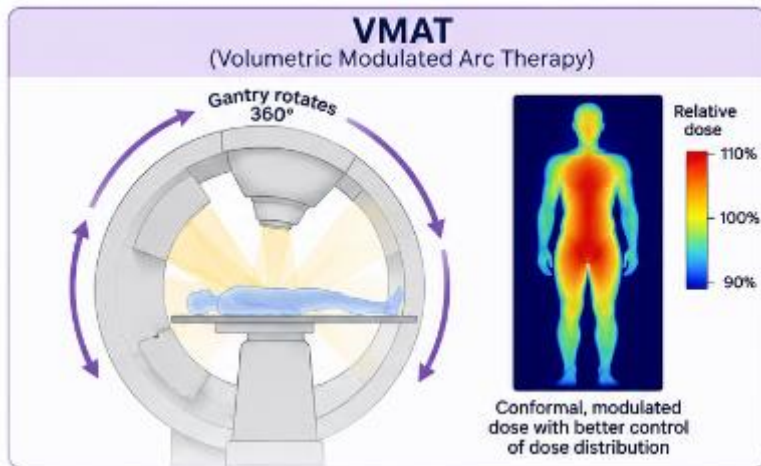
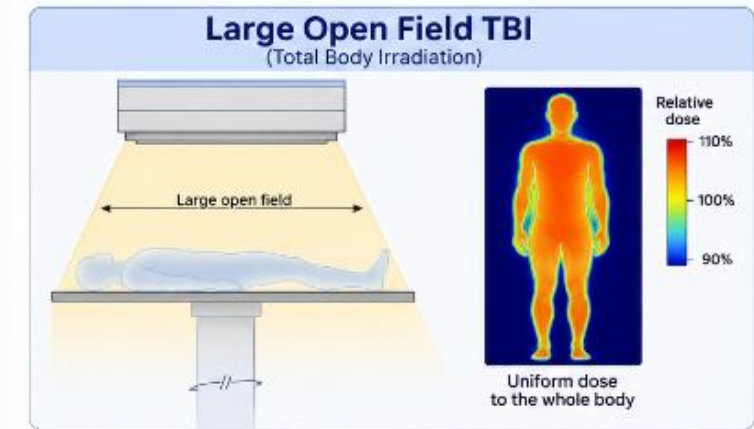
Survey results - prescription

- when asked who prescribes the TBI dose, 7 centres stated it was the treating Haematologist, 6 stated the treating Radiation Oncologist, and the remaining 6 stated it was a joint decision between Haematology and Radiation Oncology
- several participating centres clarified that Haematologists cannot prescribe radiation treatment in their medical records system; rather, the Haematologist determines the dose as per protocol and the Radiation Oncologist prescribes it



Prescriptions from
haematology

Survey results - technique



2019

- 1/14 clinics used a modulated technique

2024

- 7 clinics are using, or implementing, a modulated technique and have been doing so for 0-10 years
- 12 clinic use large open fields and have done so for an average of 21 years (range: 9–38)
- 9 of the 12 are planning on implementing a modulated technique...

A changing landscape, with many clinics moving towards modulated techniques

Survey results - doses

High dose TBI

- 12 Gy / 6 fractions / 3 days in all clinics
- 13.2 Gy / 8 or 11 fractions / 3 or 4 days
- 12 Gy / 8 fractions / 4 days
- 10 Gy / 5 fractions / 2.5 days
- 8 Gy / 4 fractions / 2 days
- ...

Low dose TBI

- 2 Gy / 1 fraction / 1 day
- 4 Gy / 2 fraction / 1 or 2 day
- ...

Total body irradiation (TBI) EBRT

ID: 4531 v.1 Endorsed



- Total body irradiation (TBI) is a highly specialised treatment technique that requires an experienced radiation oncology and transplant team.
- Effective communication and coordination between the radiation oncology and the haematology transplant teams are essential.
- TBI should only be performed in centres with the necessary quality assurance, training, experience, and protocols to deliver this treatment safely.
- TBI may be delivered by conventional treatment techniques (using large open fields at extended source-to-surface distance [SSD]) or highly conformal modulated techniques including volumetric modulated arc therapy (VMAT) or helical tomotherapy (HT).
- eviQ treatment protocols are intended for use in the adult population.

Related pages:

- [Allogeneic myeloablative conditioning CYCLOPHOSPHamide and total body irradiation \(TBI\)](#)
- [Allogeneic myeloablative conditioning etoposide and total body irradiation \(TBI\)](#)
- [Allogeneic myeloablative conditioning fludarabine and total body irradiation \(TBI\)](#)
- [Allogeneic non myeloablative conditioning \(haploidentical\) CYCLOPHOSPHamide fludarabine and total body irradiation \(TBI\)](#)
- [Allogeneic reduced intensity conditioning \(cord\) CYCLOPHOSPHamide fludarabine and total body irradiation \(TBI\)](#)
- [Allogeneic reduced intensity conditioning \(MUD\) FLAMSA \(fludarabine cytarabine amsacrine total body irradiation \(TBI\) CYCLOPHOSPHamide\)](#)
- [Allogeneic reduced intensity conditioning \(sibling\) FLAMSA \(fludarabine cytarabine amsacrine total body irradiation \(TBI\) CYCLOPHOSPHamide\)](#)
- [Allogeneic reduced intensity conditioning fludarabine and low dose total body irradiation \(TBI\)](#)
- [Allogeneic conditioning aplastic anaemia CYCLOPHOSPHamide fludarabine thymoglobuline and total body irradiation \(TBI\)](#)
- [Allogeneic intermediate intensity conditioning \(cord\) MIDI \(CYCLOPHOSPHamide fludarabine thiotepe total body irradiation \(TBI\)\)](#)

compared to 2019, the 2024 survey results showed more variation in treatment dose fractionations for both high- and low dose TBI

EviQ links fractionation to chemo

Survey results - doses

- there is heterogeneity in planning goals
- in 2024, the majority of clinics using modulated techniques specify the lung and kidney dose constraints to be less than the prescription dose
- one clinic using the VMAT TBI technique also specified constraints on the spinal cord and bowel



With modulated techniques,
specific organ doses can be
decreased

Survey results – adopting change

- none of the 4 clinics currently using a modulated technique are looking to change their technique
- of the 12 clinics that are using large open fields: 3 do not have plans to change technique; while 9 centres responded that they are seeking to implement a modulated technique
- 1 clinic indicated that TBI will facilitate Chimeric Antigen Receptor (CAR) T-Cell therapy
- since the survey, 2 clinics have implemented VMAT TBI, and one did 2 weeks ago!



a majority of clinics using large open fields plan to change technique

Final thoughts 1

- there is a trend towards implementing modulated techniques in ANZ
- the shift to modulated TBI is likely influenced by evidence-based practice guidelines and clinical reports suggesting improved patient outcomes
- globally, interest in techniques other than large open fields has likely been stimulated by recent TBI conferences, including those held in Utrecht in 2023 and 2025, the TBI symposium in Perth in 2023, and in the broader networking within the ANZ TCT community



a majority of clinics using large open fields plan to change technique

Final thoughts 2

- in the paediatric setting, higher TBI lung doses are associated with potentially lethal pulmonary complications and inferior survival. A paediatric TBI guideline published in 2022 specified dose aims, such as mean lung dose ≤ 8 Gy and mean kidney dose ≤ 10 Gy
- adult TBI guidelines and recommendations are becoming prescriptive and potentially more helpful for centres looking to set up VMAT TBI. A paper on VMAT TBI published in 2025 recommended a mean lung dose < 8 Gy and mean kidney dose < 8 – 10 Gy for 1.5–2 Gy fractionated VMAT TBI plans, as well as OAR considerations for the lens, brain, thyroid, breasts, and heart

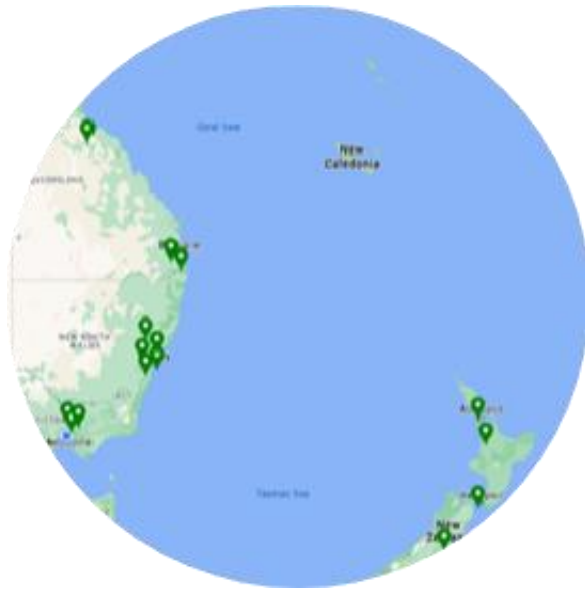


Final thoughts 3

- TBI practice in ANZ has changed considerably in the past five years, with more centres using, or planning to use, modulated techniques in keeping with recommendations from contemporary guidelines and trials
- the 2024 survey highlights opportunities for establishing consensus protocols and standardised reporting across ANZ, as well as the role of the ANZTCT TBISIG in guideline development and facilitating collaboration, which may drive beneficial change and ultimately advance TBI treatments
- we hope to repeat the survey in another five years' time to continue mapping clinical practice



Thank you and questions



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