RANZCR ASM October 2007
Paediatric CT Dosimetry Survey
A QUDI Funded Research Project

Anthony Wallace[1], Kimberley Sibelle[2], Martin Stanley[2], Ray Budd[2] and Stacey Goergen[3].

1. Austin Health

2. Monash University

3. Monash Medical Centre

Objectives

- National survey of expert paediatric CT sites to determine;
  - Dosimetry for generic scans measured as Dose Length Product (mGy.cm)
  - Impact of optimisation training on initial dosimetry as determined by a follow up survey
  - The potential to develop this survey technique into a national CT dosimetry survey

Survey Data

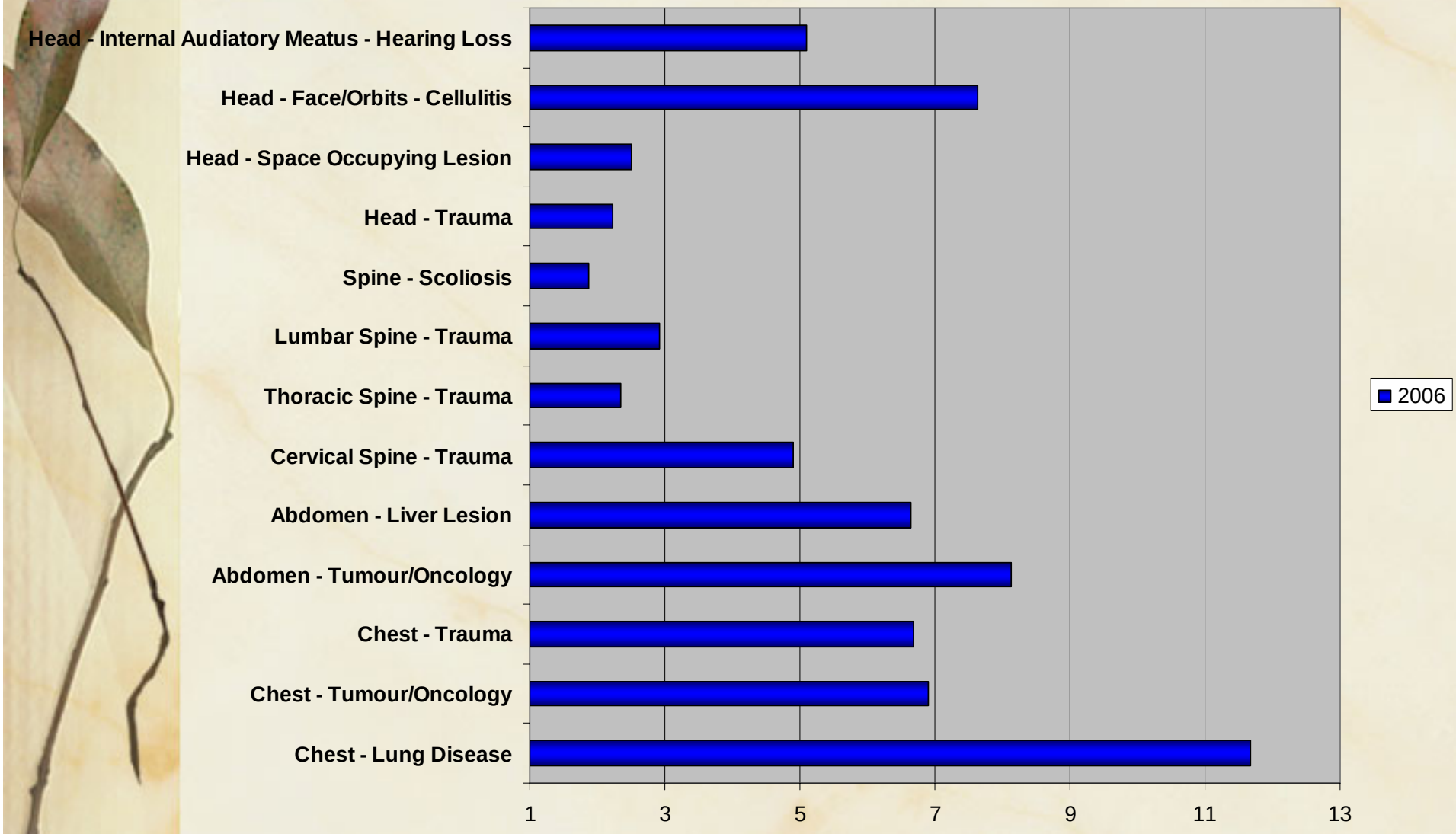
- 2 Surveys – July, 2006 & May, 2007
- 8 sites initially surveyed across all States – 6 returns + 1 extra site wanted involvement
- 13 generic CT scanning protocols for 5 yo were surveyed
- Survey comprised
  - Data sheet requesting protocol parameters
  - Phantom graphic to mark superior & inferior margins
  - CT-Expo used as software dosimetry engine
  - Indicative data calculated and used was Dose Length Product (mGy.cm)

Survey Data

- 7 sites – 6 models of MSCT Scanners
  - 2 Philips Brilliance 64
  - 1 GE LightSpeed Plus 4
  - 1 GE LightSpeed Pro 16
  - 1 Siemens Sensation 16
  - 1 Siemens Sensation 64
  - 1 Toshiba Aquilion 64

Examination	Initial Survey DLP (mGy.cm) – Calculated by CT-Expo					
	Clinical Centre A	Clinical Centre B	Clinical Centre C	Clinical Centre D	Clinical Centre E	Clinical Centre F
Chest - Lung Disease	64	79	350	44	30	73
Chest - Tumour/Oncology	346	400	195	128	312	58
Chest - Trauma	388	353	195	128	160	28
Abdomen - Tumour/Oncology	568	679	1284	256	640	158
Abdomen - Liver Lesion	1190	1820	1751	274	524	336
Cervical Spine - Trauma	88	432	137	215	142	100
Thoracic Spine - Trauma	180	421	391	304	216	195
Lumbar Spine - Trauma	113	331	307	189	143	242
Spine - Scoliosis	240	N/A	348	367	N/A	197
Head - Trauma	467	381	375	414	520	372
Head - Space Occupying Lesion	933	762	750	414	857	372
Head - Face/Orbits - Cellulitis	619	204	273	81	207	140
Head - Internal Auditory Meatus - Hearing Loss	205	150	84	364	429	158

Initial Survey - DLP Spread Max/Min Ratio



CT Optimisation Workshop

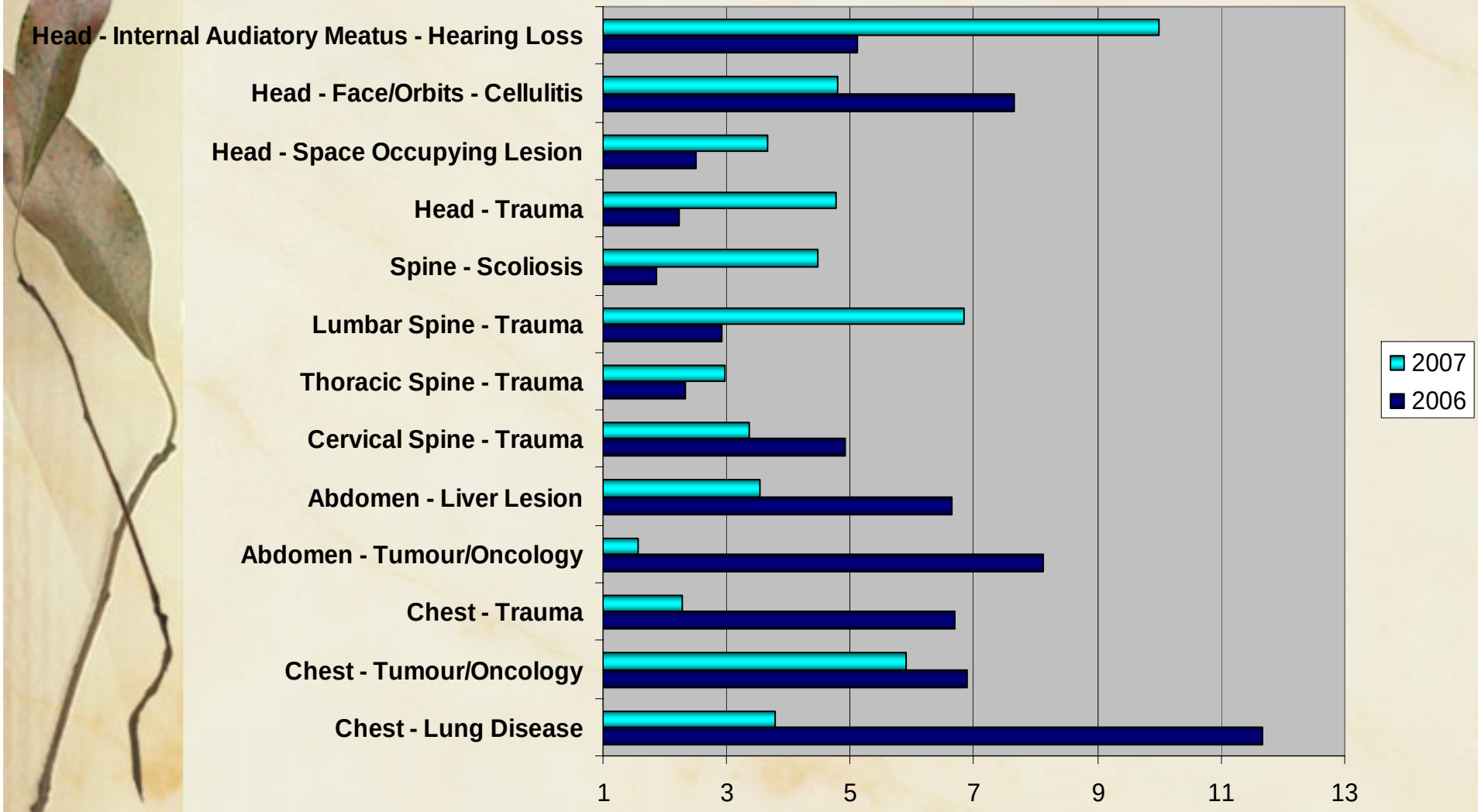
- Melbourne, November 2006
- Topics
  - CT platforms
  - CT dosimetry
  - Presentation of blinded initial survey data
  - CT acquisition parameter optimisation theory
    - Dose
    - Image quality
- Promise (threat) to re-survey

Dose Saving Factor Adjustments

Operator choice of

- kVp
- mAs for manual & starting mAs for dose modulation
- Pitch
- Beam width
  - Acquisition slice width
- Scan length
- Contrast use
- Series

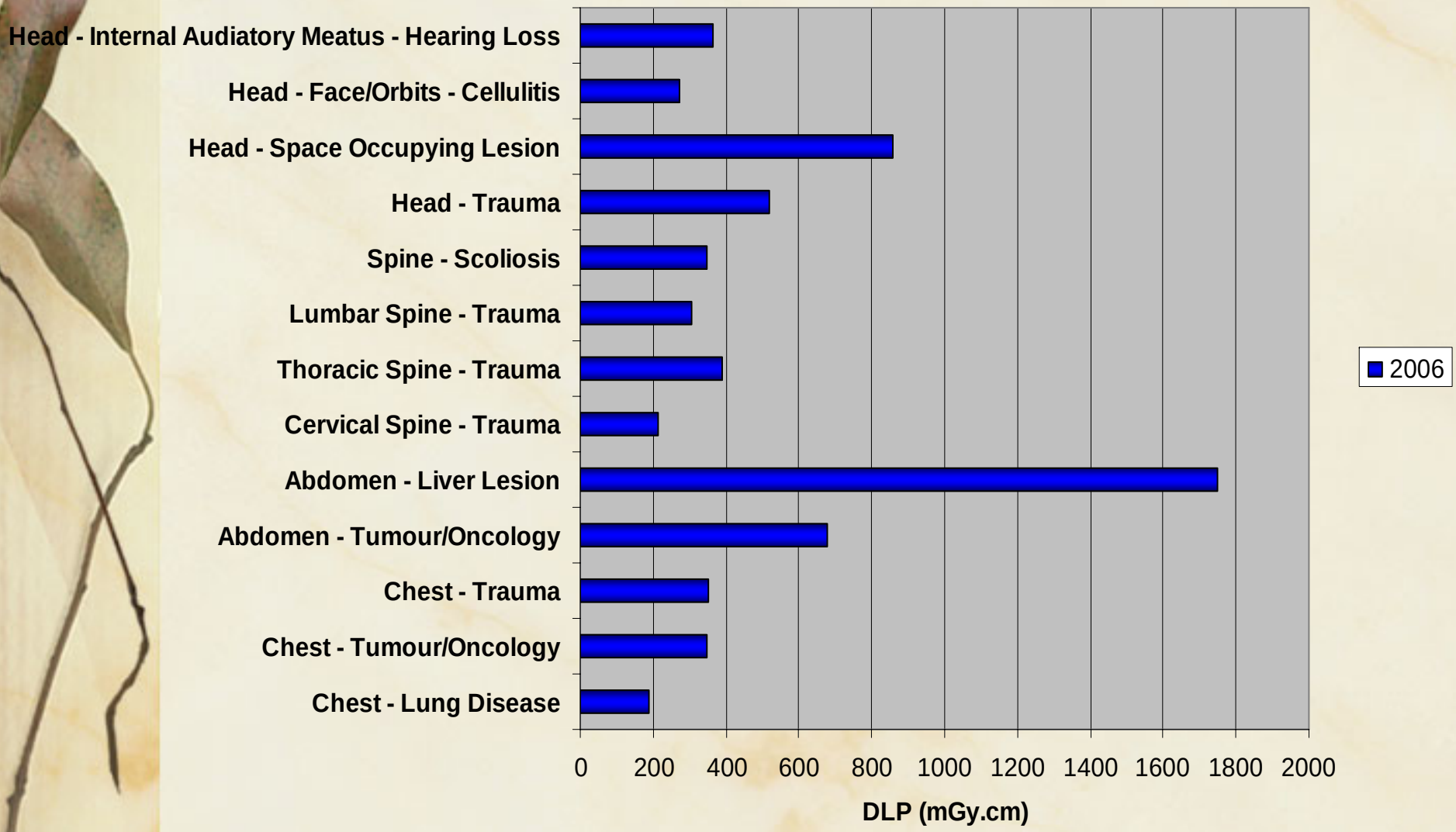
Comparative DLP Spread Max/Min Ratio



Diagnostic Reference Level using DLP (mGy.cm)

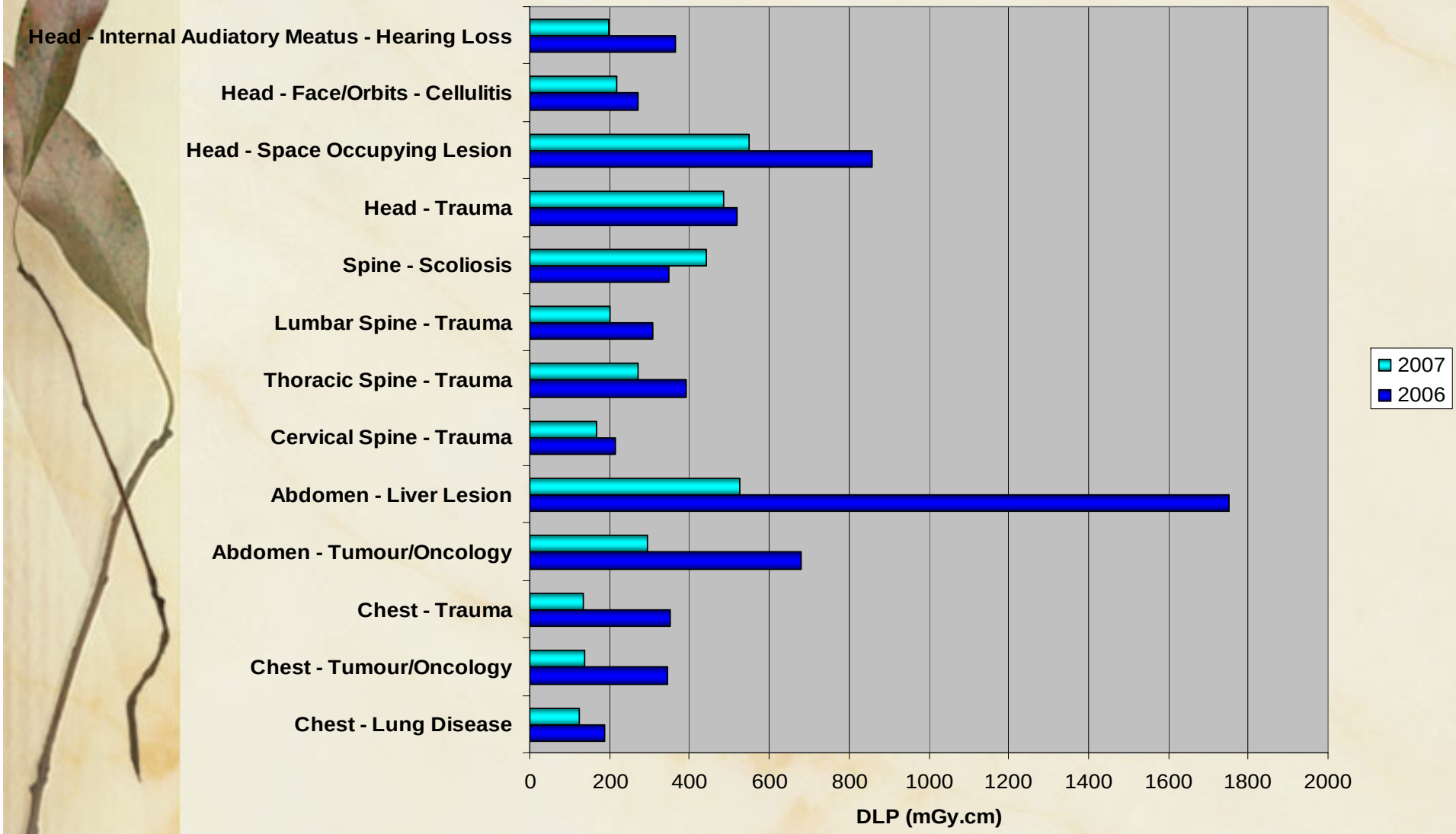
- Arbitrary measure
- For this project it is taken as the 6th ranked highest DLP for each protocol
- Internationally accepted as 75th percentile ranking across a surveyed population
- A dynamically changing value used as an indicator of dose efficiency in radiology practice

Initial Survey Diagnostic Reference Level - 2006

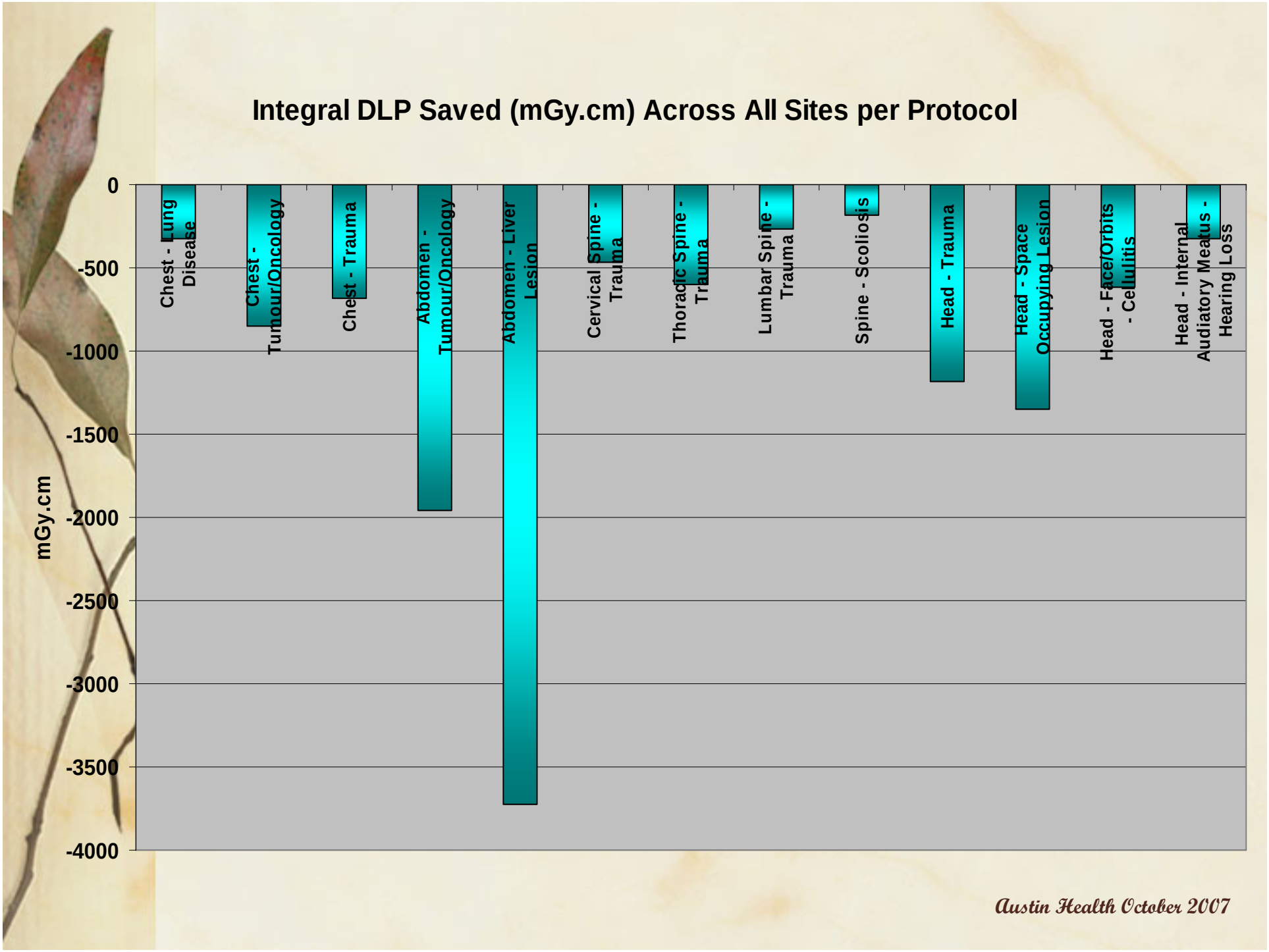


Austin Health October 2007

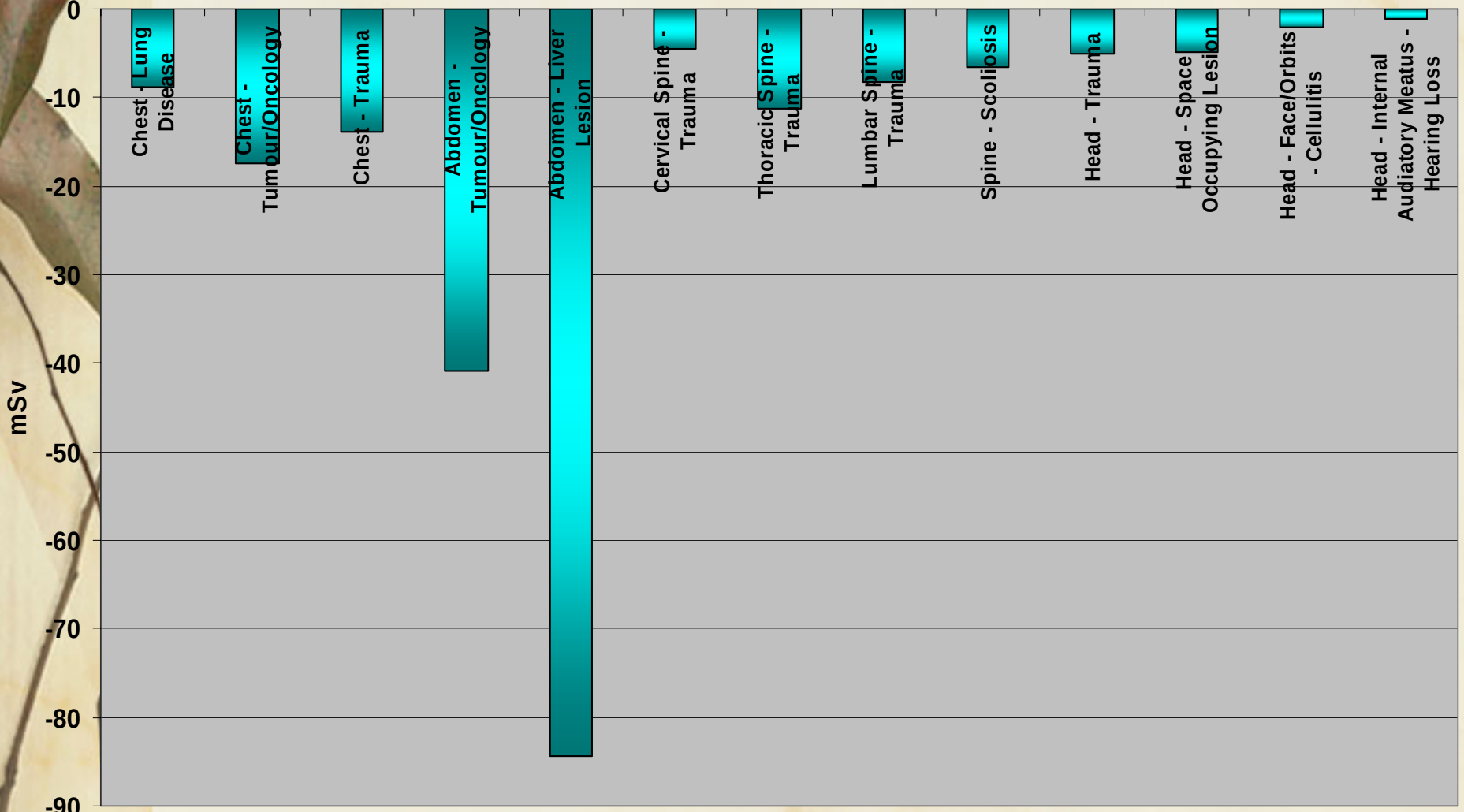
Comparative Diagnostic Reference Level - 2006 & 2007



Austin Health October 2007


Integral DLP Saved (mGy.cm) Across All Sites per Protocol
mGy.cm
0
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
Chest - Lung Disease
Chest - Tumour/Oncology
Chest - Trauma
Abdomen - Tumour/Oncology
Abdomen - Liver Lesion
Cervical Spine - Trauma
Thoracic Spine - Trauma
Lumbar Spine - Trauma
Spine - Scoliosis
Head - Trauma
Head - Space Occupying Lesion
Head - Face/Orbits - Cellulitis
Head - Internal Audiatory Meatus - Hearing Loss
Austin Health October 2007

Integral Effective Dose Saved (mSv) Across All Sites per Protocol



Conclusion

- Optimisation training can positively influence paediatric CT patient dosimetry
- There are no universal 'right' dose answers
- Appropriate application depends upon the technical expertise of users and scientific support staff
- Practices should work towards development of local DRL's and optimized dose-image quality relationships
- This survey technique could be expanded into a National survey to establish baseline comparative DRL values