Starting a glioma database - The TUM experience

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Why would you want a database?

- Larger n for discovery / validation
- Test generalizability across scanners / centers
- Serve as data source for challenges
- …

From Excel to a database

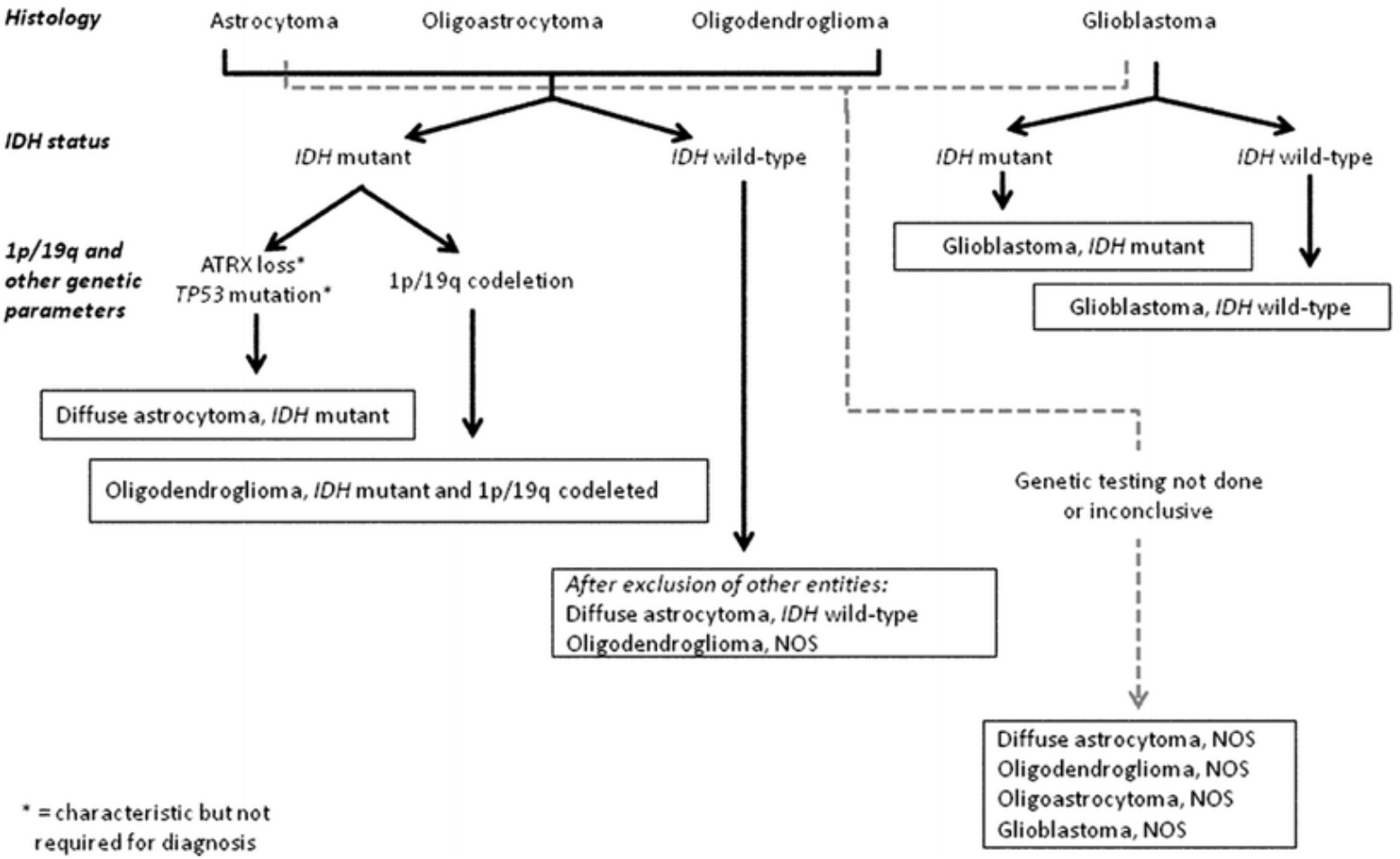
- Local, with neurology / neurosurgery / neuropathology
- „Data information system“
- Some automatic information (Tumor volume, OS …)

…to a multi-center database

- Bjoern Menze (TUM Computer Science)
- Roland Wiest (Bern Neuroradiology)
- Several interested centers in D-A-CH

What data do we want?

- Clinical?
- Pathology data?
- Imaging data / sequences?
- (Anonymization / Pseudonymization)



Louis et al., Acta Neuropathologica 2016

	3D T1w Pre	Ax 2D FLAIR	Ax 2D DWI		Ax 2D T2w	3D T1w Post[b]
Sequence	IR-GRE[d,e]	TSE[c]	EPI[f]	Contrast Injection[a]	TSE[c]	IR-GRE[d,e]
Plane	Sagittal/axial	Axial	Axial		Axial	Axial/sagittal
Mode	3D	2D	2D		2D	3D
TR [ms]	2100[g]	>6000	>5000		>2500	2100[g]
TE [ms]	Min	100–140	Min		80–120	Min
TI [ms]	1100[h]	2500				1100[h]
Flip angle	10°–15°	90°/≥160°	90°/180°		90°/≥160°	10°–15°
Frequency	256	≥256	128		≥256	256
Phase	256	≥256	128		≥256	256
NEX	≥1	≥1	≥1		≥1	≥1
FOV	256 mm	240 mm	240 mm		240 mm	256 mm
Slice thickness	1 mm	3 mm	3 mm		3 mm	1 mm
Gap/apacing	0	0	0		0	0
Diffusion options			b = 0, 500, and 1000 s/mm^2 ≥3 directions			
Parallel imaging	Up to 2x	Up to 2x	Up to 2x		Up to 2x	Up to 2x
Scan time (approx)	5–8 min	4–5 min	3–5 min		3–5 min	5–8 min

Ellingson et al., Neuro-Oncology 2015

Anonymization

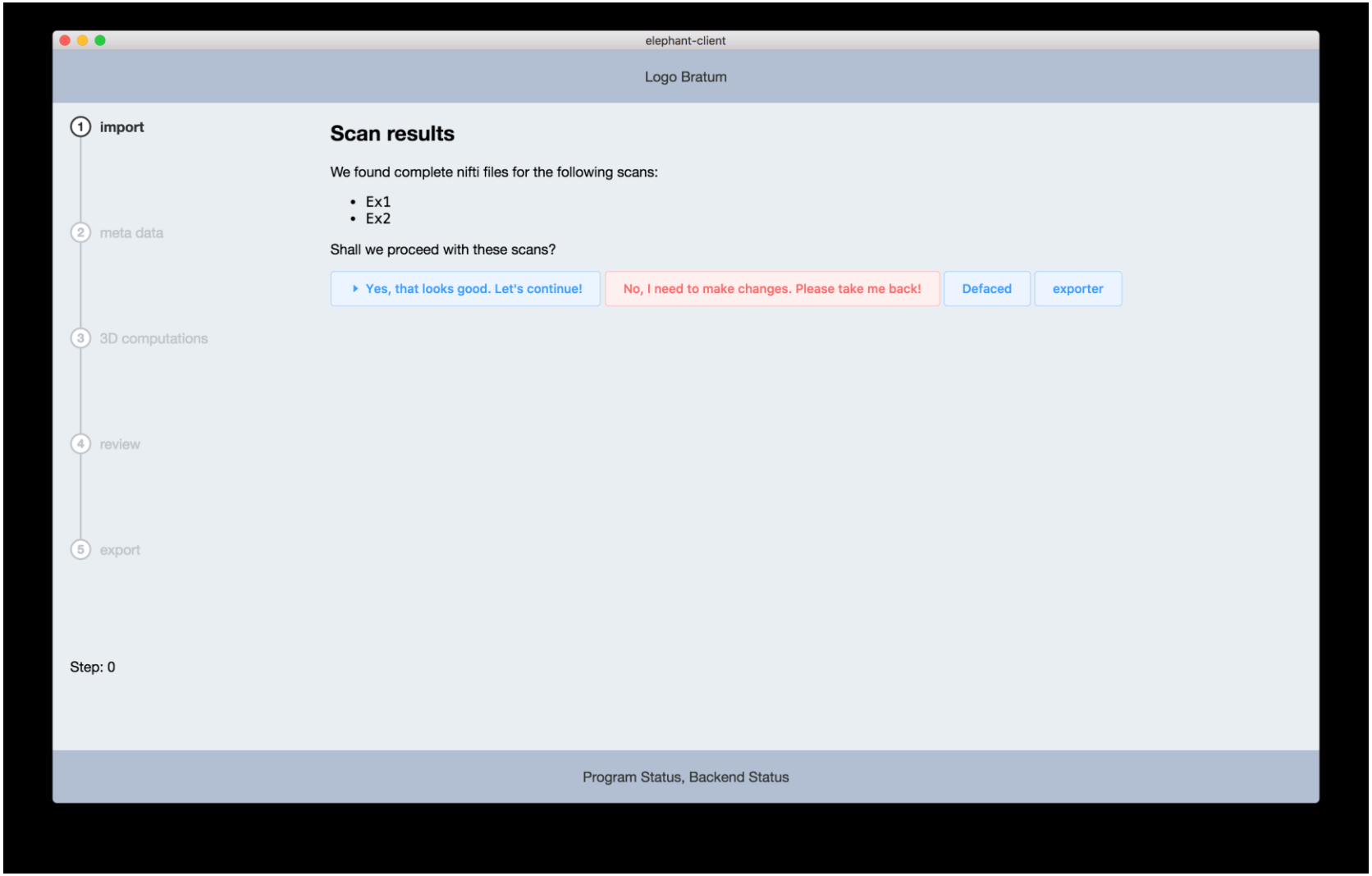
- Easier, „safer“

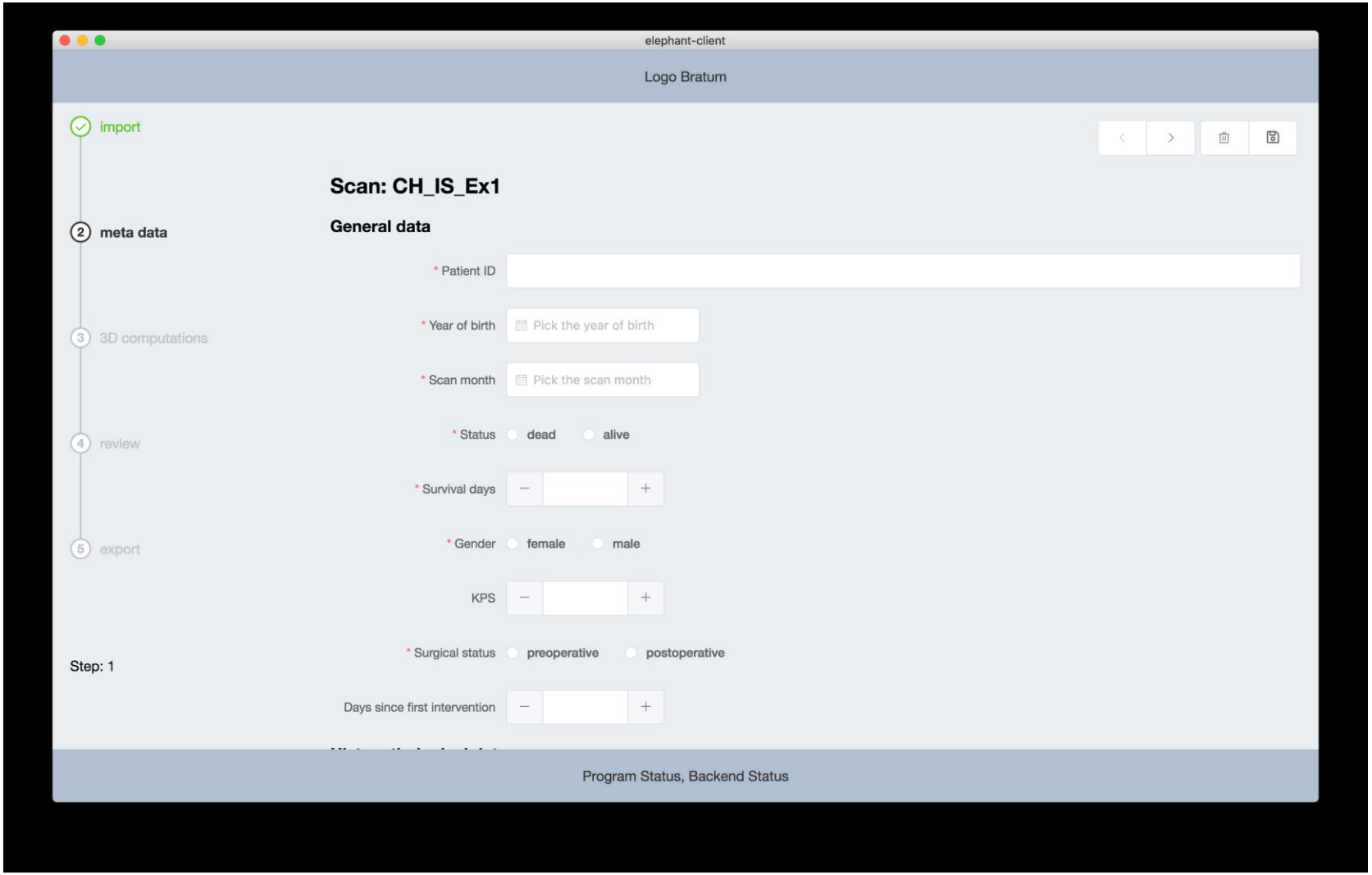
Pseudonymization

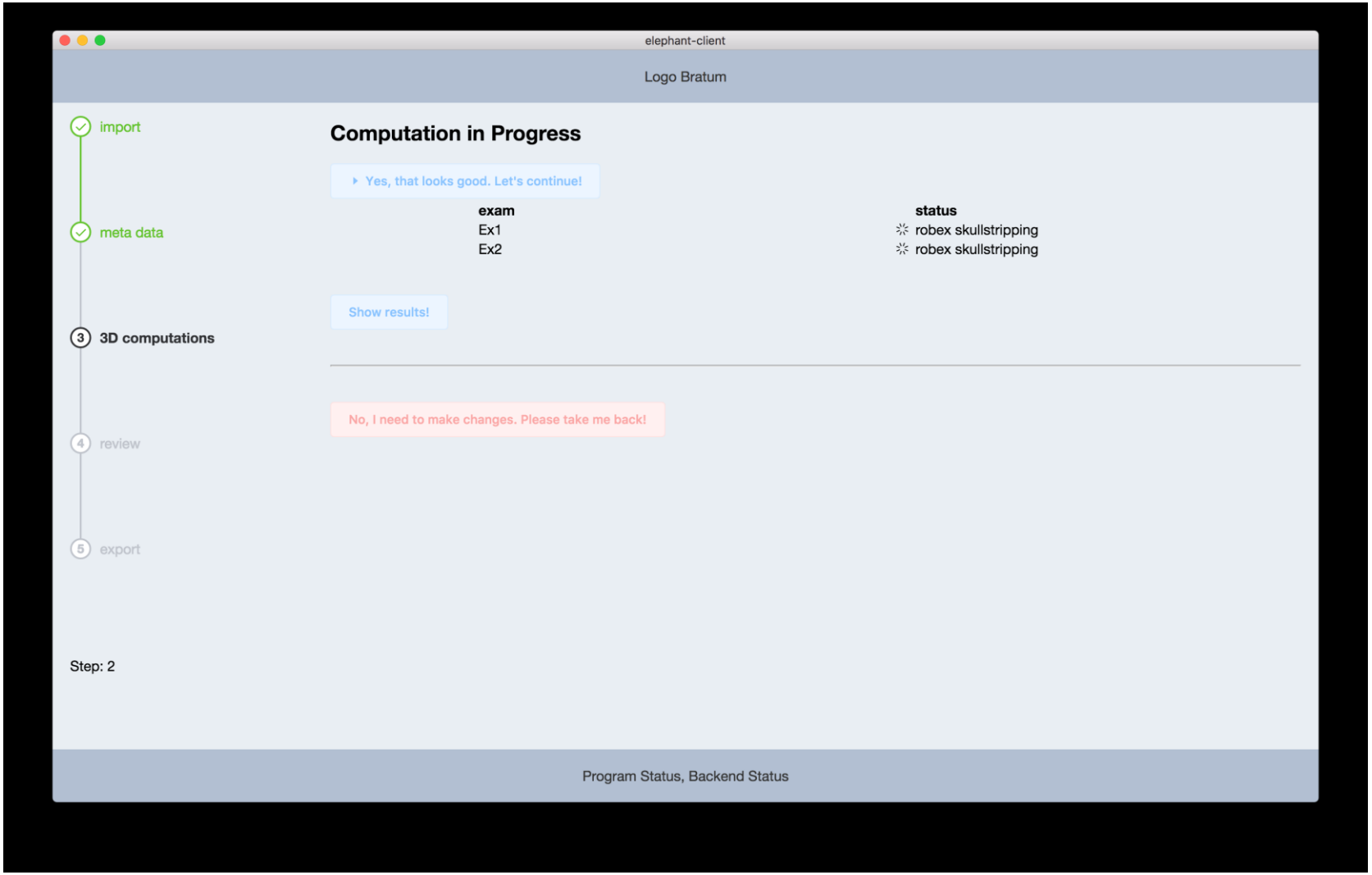
- Follow-up over time

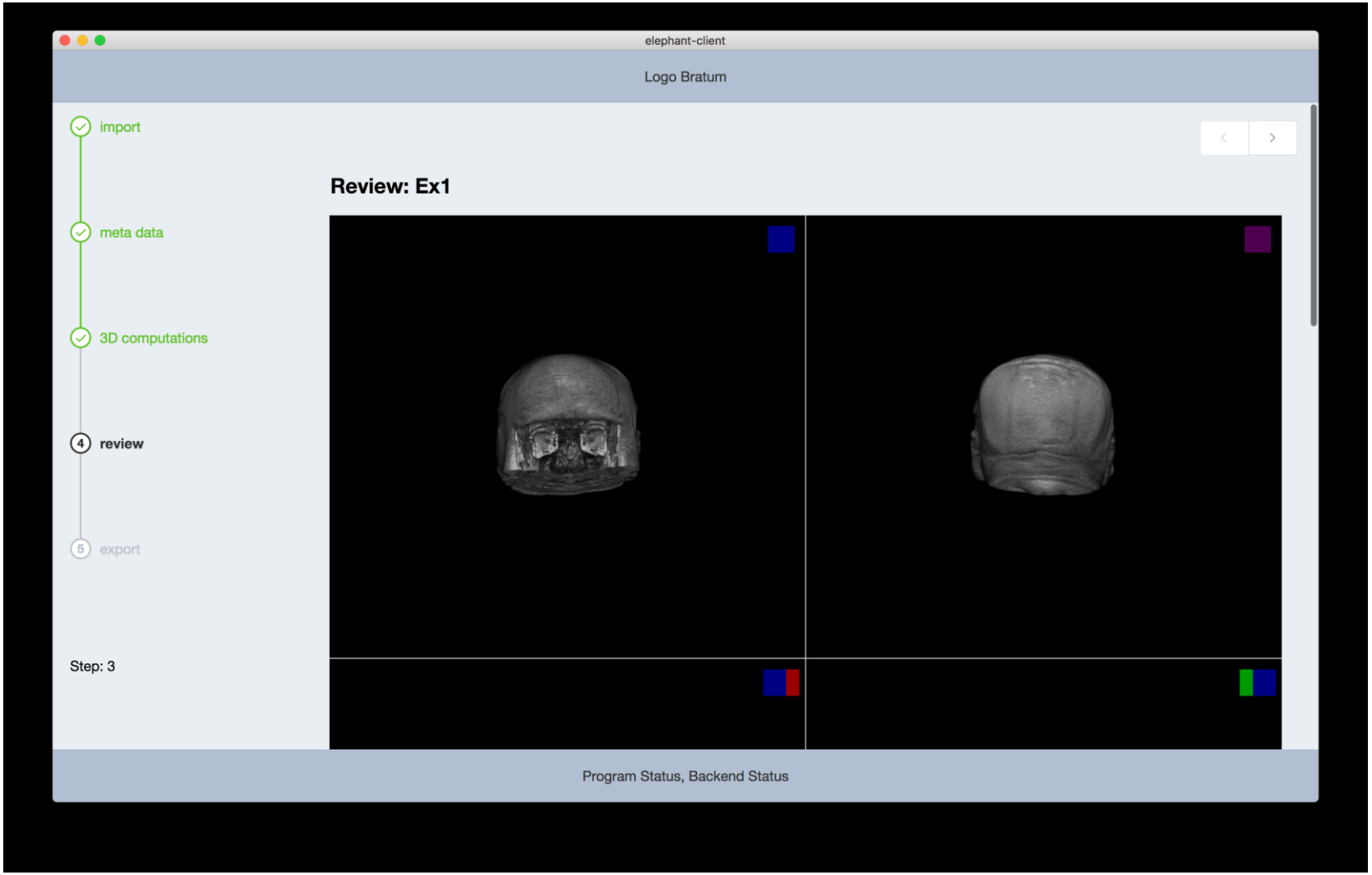
Local pre-processing software

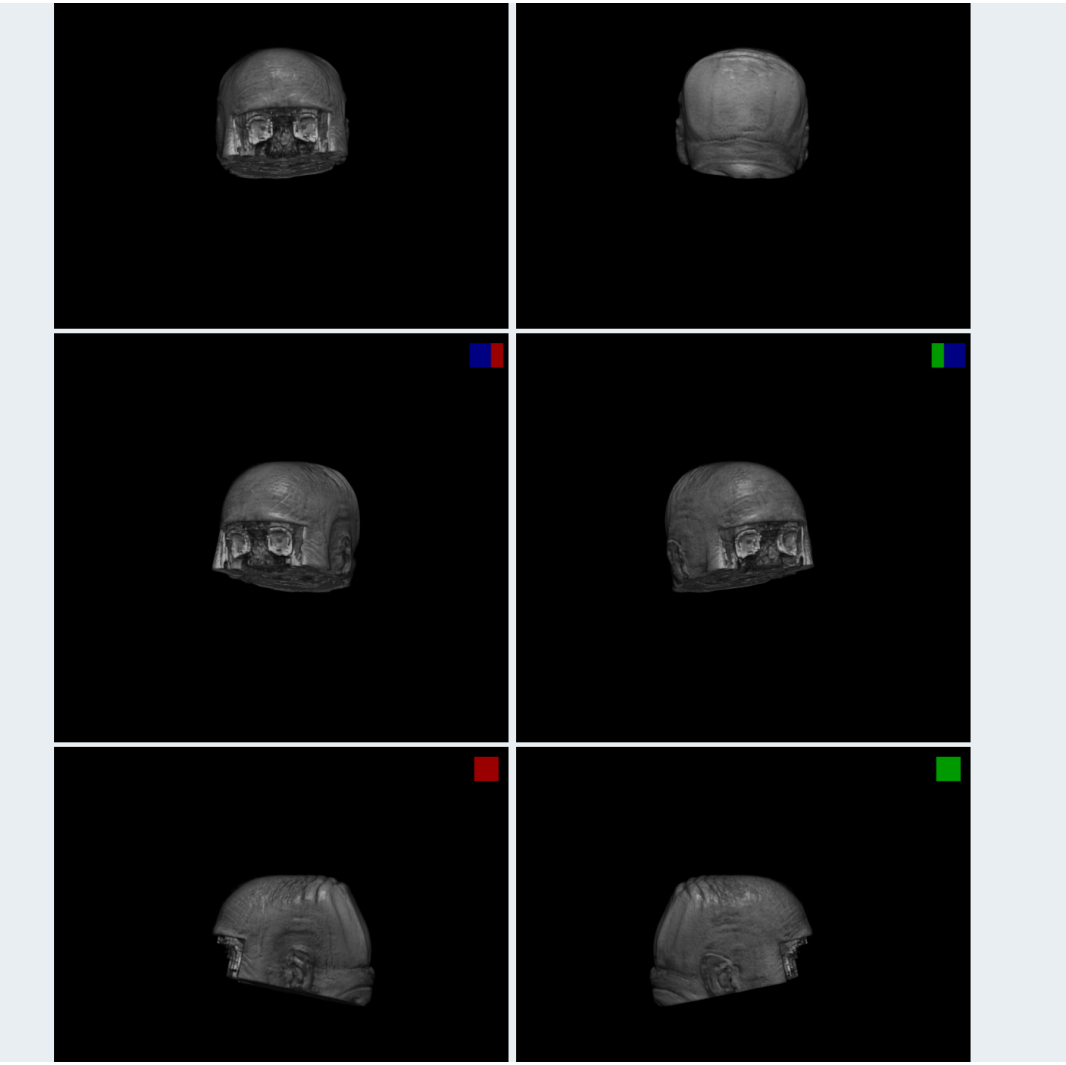
- DICOM -> NiFTI
- Co-registration, skull-stripping (saves transforms)
- Pseudonymization
  - Hash algorithm using a local password?
  - Local pseudonymization (list-based)?
- Metadata saved as .JSON


elephant-client
Logo Bratum
1 import
2 meta data
3 3D computations
4 review
5 export
Scan results
We found complete nifti files for the following scans:
Ex1
Ex2
Shall we proceed with these scans?
Yes, that looks good. Let's continue!
No, I need to make changes. Please take me back!
Defaced
exporter
Step: 0
Program Status, Backend Status


elephant-client
Logo Bratum
import
2 meta data
3 3D computations
4 review
5 export
Step: 1
Scan: CH_IS_Ex1
General data
* Patient ID
* Year of birth
Pick the year of birth
* Scan month
Pick the scan month
* Status
dead
alive
* Survival days
* Gender
female
male
KPS
* Surgical status
preoperative
postoperative
Days since first intervention
Program Status, Backend Status


elephant-client
Logo Bratum
import
meta data
3 3D computations
review
export
Step: 2
Computation in Progress
Yes, that looks good. Let's continue!
exam
Ex1
Ex2
status
robex skullstripping
robex skullstripping
Show results!
No, I need to make changes. Please take me back!
Program Status, Backend Status


elephant-client
Logo Bratum
import
meta data
3D computations
4
review
5
export
Step: 3
Review: Ex1
Program Status, Backend Status



Central storage

- **Secure upload**
- **Central post-processing (e.g. BRATS algorithms)**
- **Encrypted storage on LRZ servers**

Data use

- For members of the working group
- Central request
- „Opt-out“
- (Anonymized data for challenges)