

Understanding the human factor by making understandable visualizations

by *Gerrit Muller* Buskerud University College

e-mail: `gerrit.muller@hibu.no`

`www.gaudisite.nl`

Abstract

Architecture Frameworks offer many representations to visualize views. Unfortunately, many of these representations focus more on being complete and precise, rather than being understandable. Many of the stakeholders do insufficiently understand these representations. The designers at the same time do insufficiently understand the human factors in the system context, since most of these have been abstracted away.

We show that simple diagrams in, for instance, space and time help to bridge these two worlds and help both stakeholders and designers. We will illustrate this by examples from Magnetic Resonance Imaging.

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Distribution

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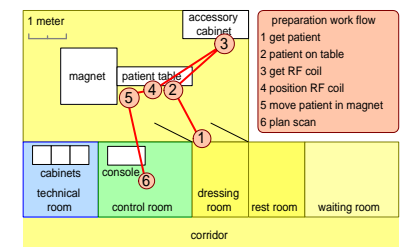
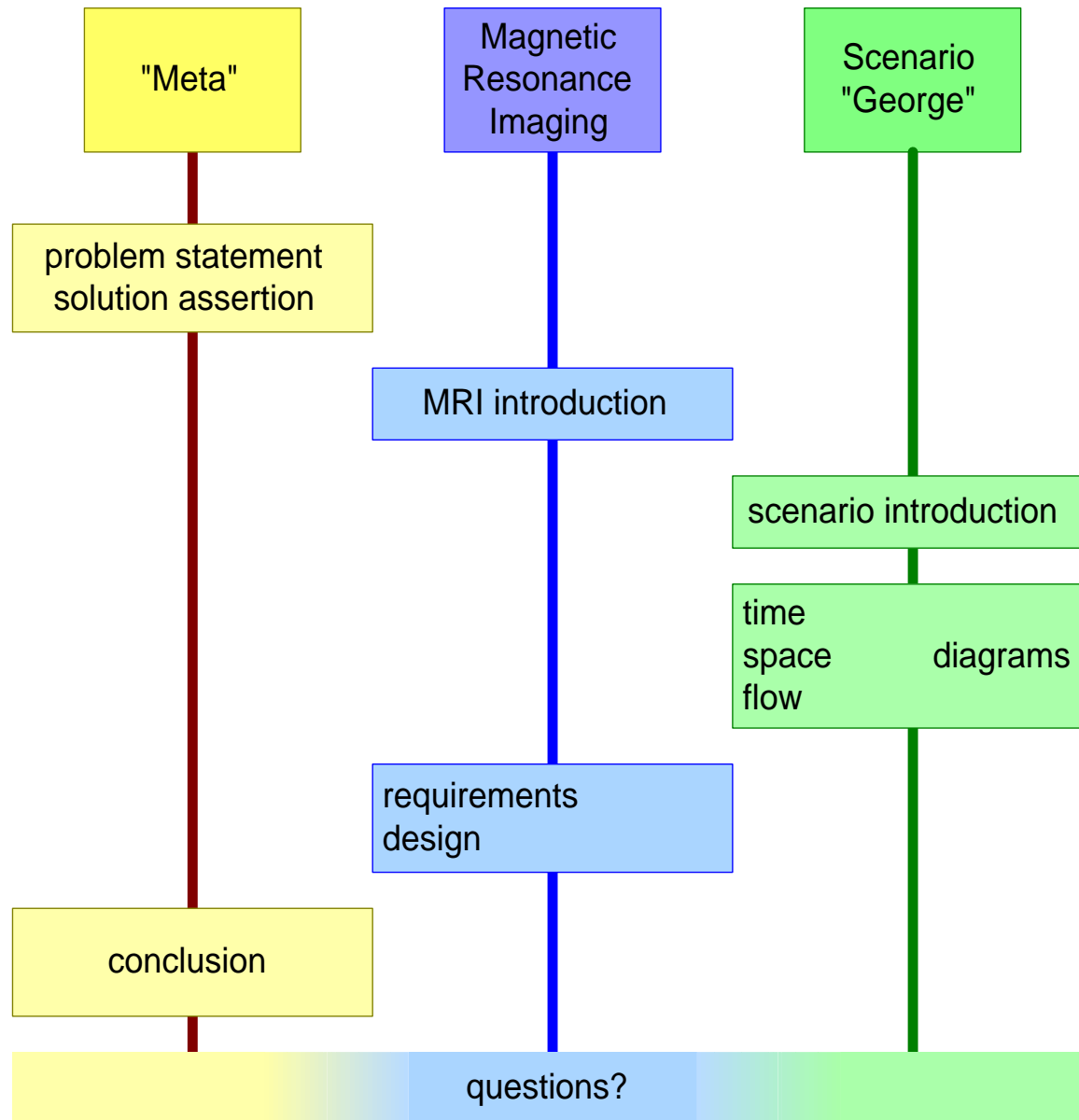
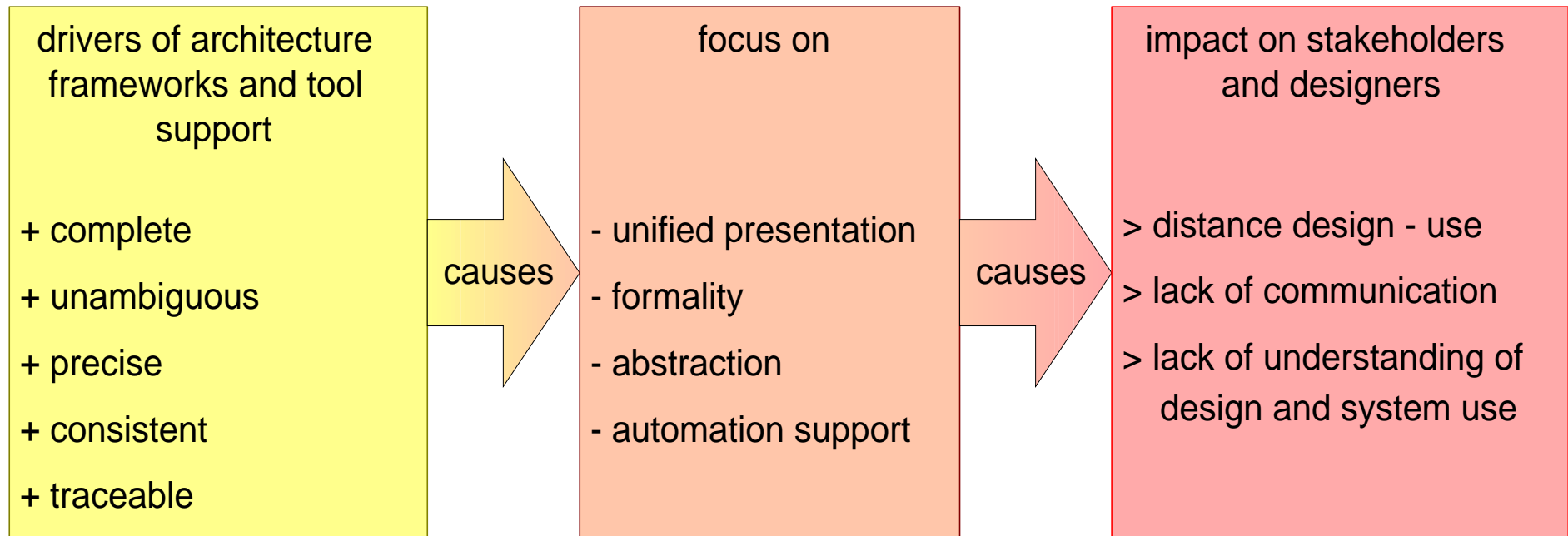


Figure Of Contents™



Problem Statement



Today's Architecture Frameworks

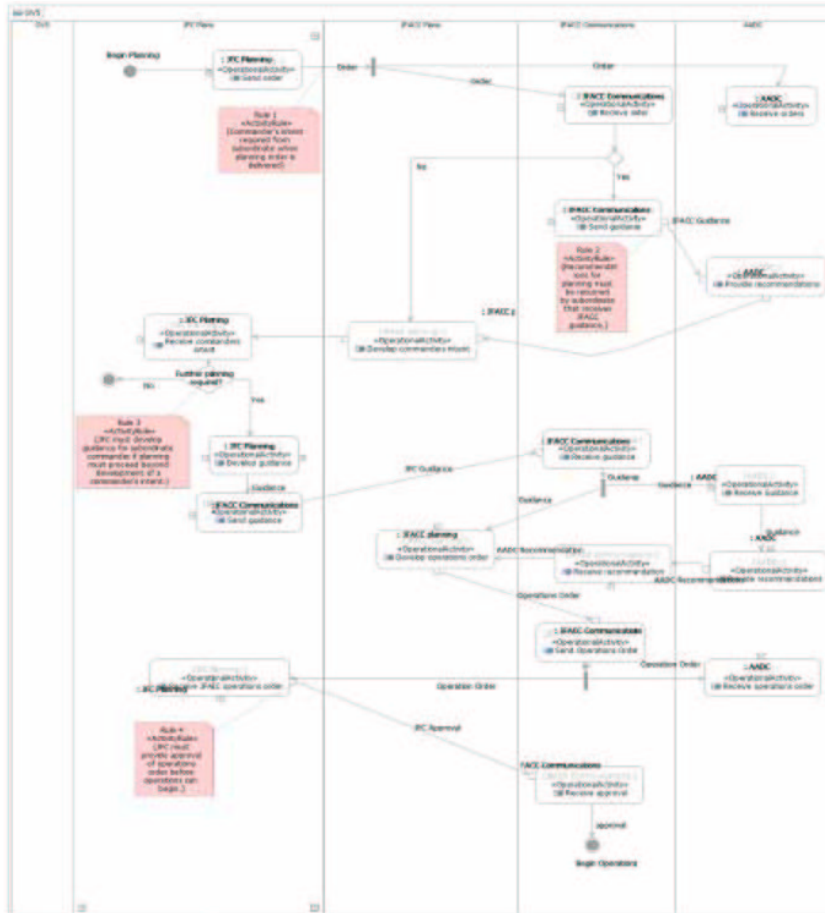


Figure 4 - Operational activities and behavior of the nodes supporting JFACC planning

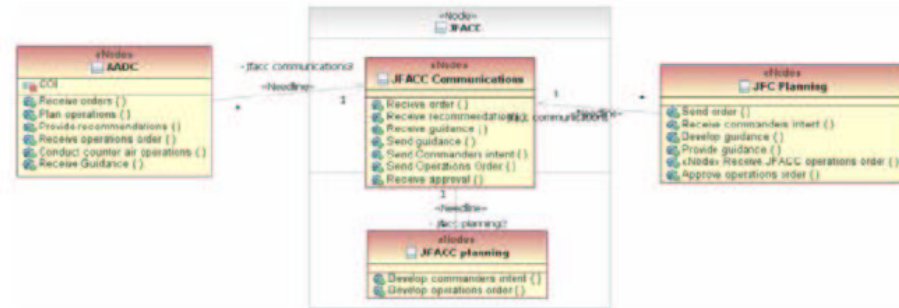


Figure 2 - OV-2 Operational node interactions and headlines based on joint planning doctrine

6. OV-3: Operational Information Exchange Matrix

Table 3 - OV-3 Matrix

Needline	Information Element	Producer Node	Consumer Node	UJTL Task	Transaction Type	Timing	QoS Rqmt	Security Classif. (highest)	Distribution Handling
AADC::JFACC Communications	AADC Recommendations	AADC	JFACC Communications	Air Operations Planning	Point to Point	periodic 24 hr	best effort (receipt)	U	US only
JFACC Communications::AADC	Operations Orders	JFACC Communications	AADC	Air Operations Planning	Force Broadcast	periodic 24 hr	best effort	U	Coalition
JFACC Communications::AADC	JFACC Guidance	JFACC Communications	AADC	Air Operations Planning	Point to Point	when issued	reliable	U	Coalition
JFACC Communications::JFACC Planning	AADC Information	JFACC Communications	JFACC planning	Air Operations Planning	Point to Point	on event	best effort (receipt)	U	Coalition
JFACC Communications::JFACC Planning	Force Orders	JFACC Communications	JFACC planning	Air Operations Planning	Force Broadcast	when issued	best effort	U	Coalition
JFACC Planning::JFACC Communications	Operations Orders	JFACC Planning	JFACC Communications	Air Operations Planning	Force Broadcast	periodic	best effort	U	Coalition
JFACC Planning::JFACC Communications	JFACC Guidance	JFACC Planning	JFACC Communications	Air Operations Planning	Point to Point	when issued	reliable	U	Coalition

examples from: OMG Document Number: dtc/2007-08-02 <[ftp://ftp.omg.org/pub/docs/dtc/07-08-02.pdf](http://ftp.omg.org/pub/docs/dtc/07-08-02.pdf)>

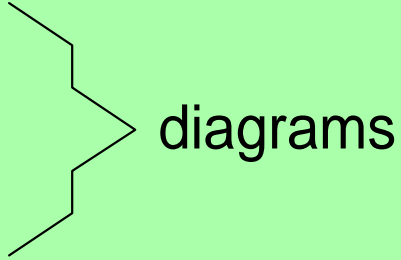
Assertion: How can we Solve this Problem?

solution assertion:

use more diagrams and representations
that are close to the human experience
and use concrete examples

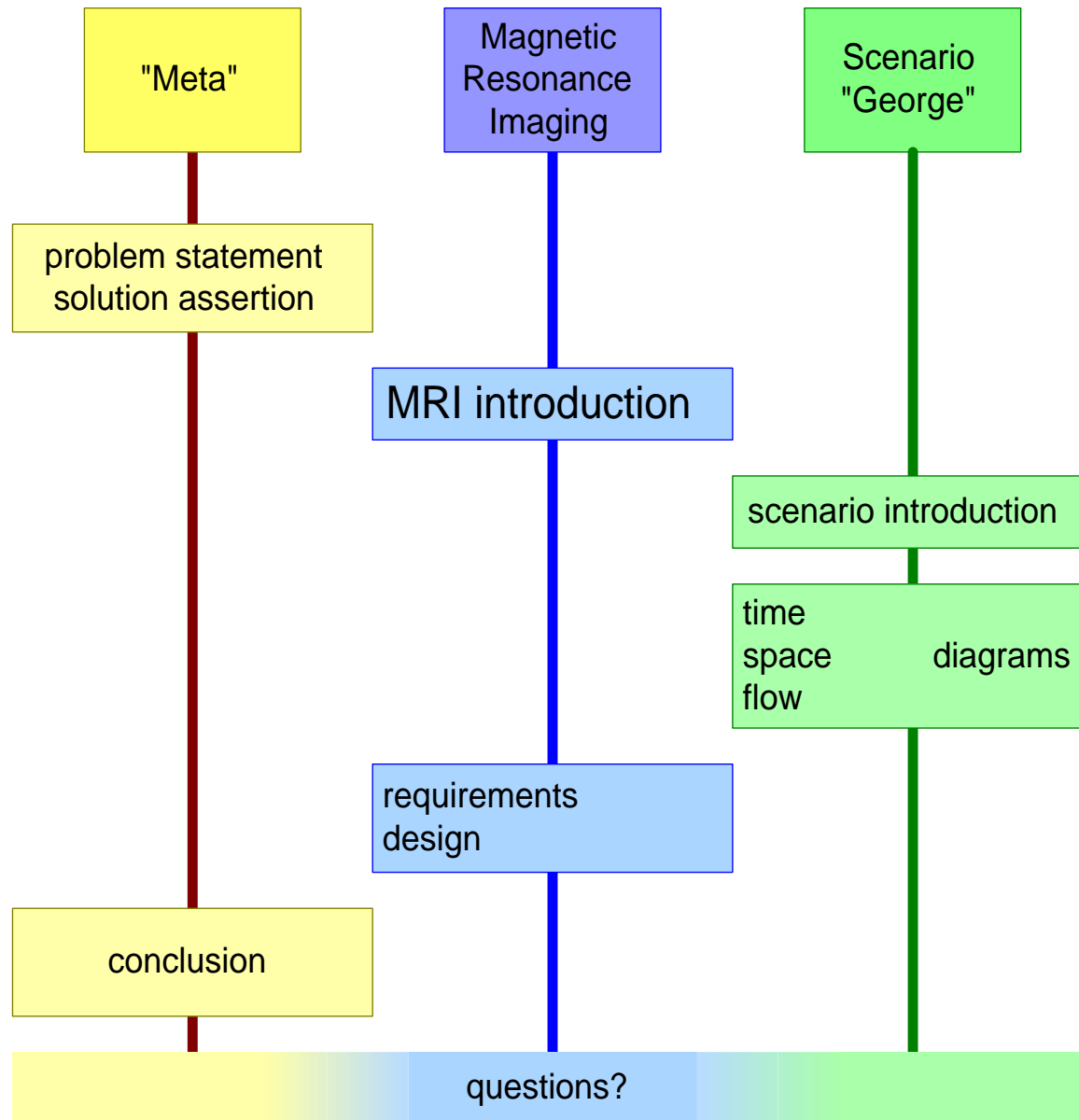
examples:

time
space (e.g. maps)
flow
scenario's, stories

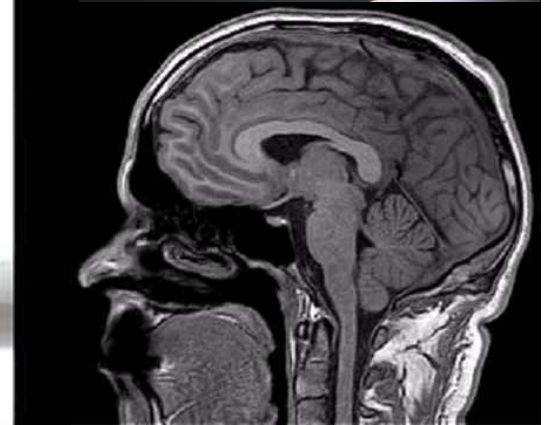
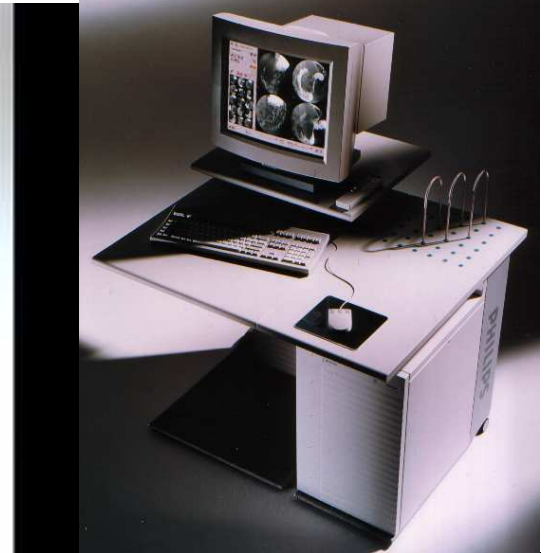


diagrams

Magnetic Resonance Imaging Introduction



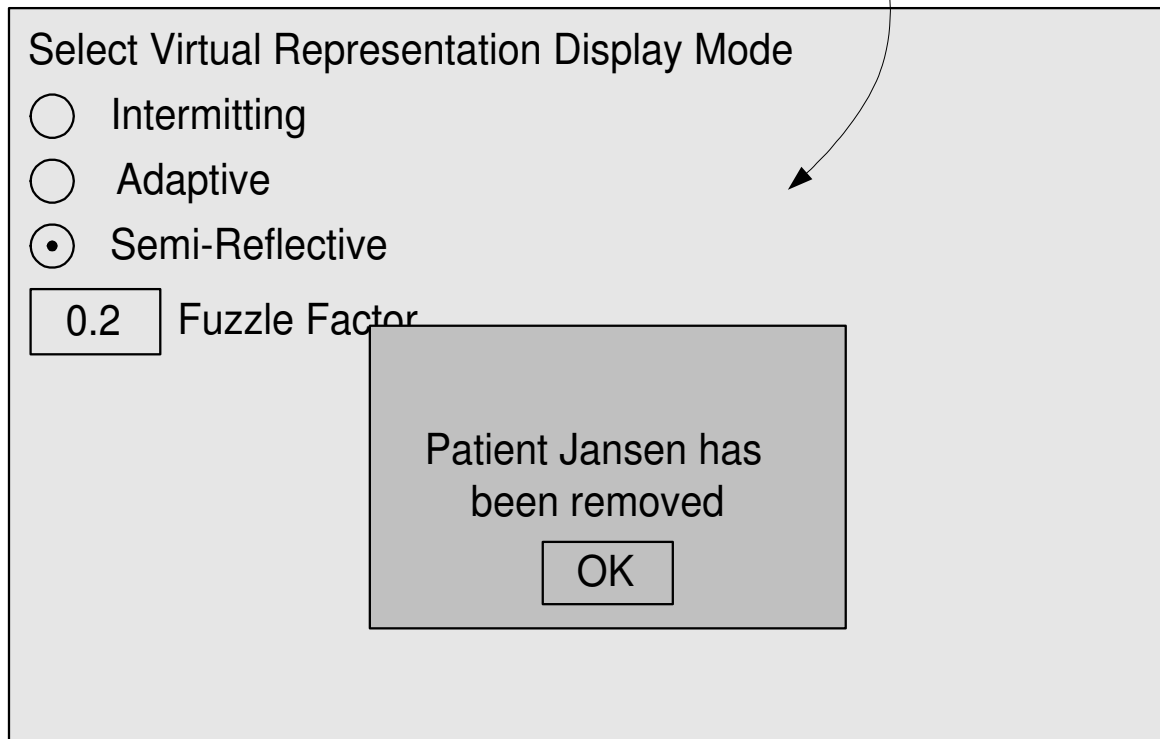
Case: Magnetic Resonance Imaging (MRI)



Example of Engineering Induced Problem

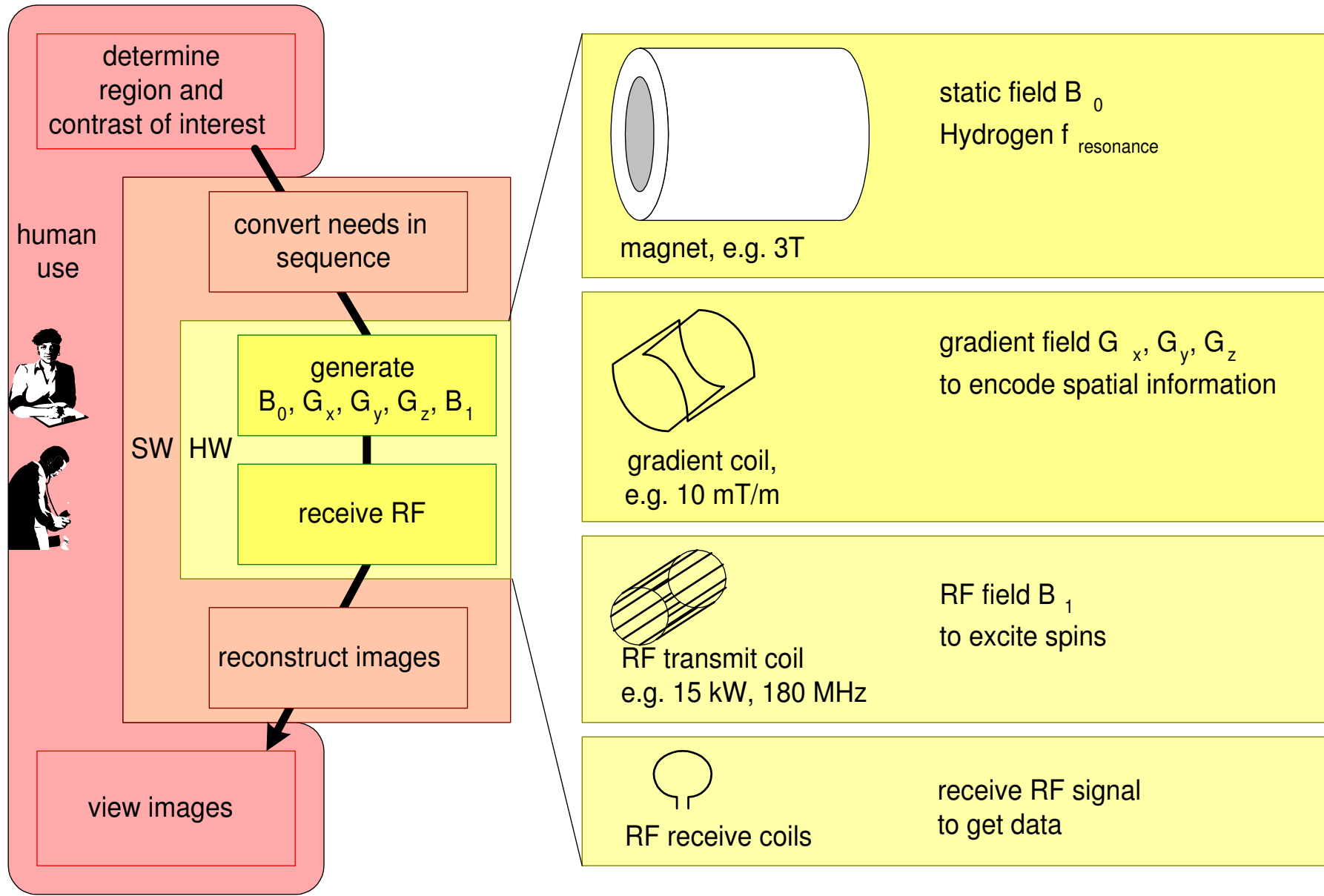
The engineer creates a technological UI...

without imagining the clinical reality

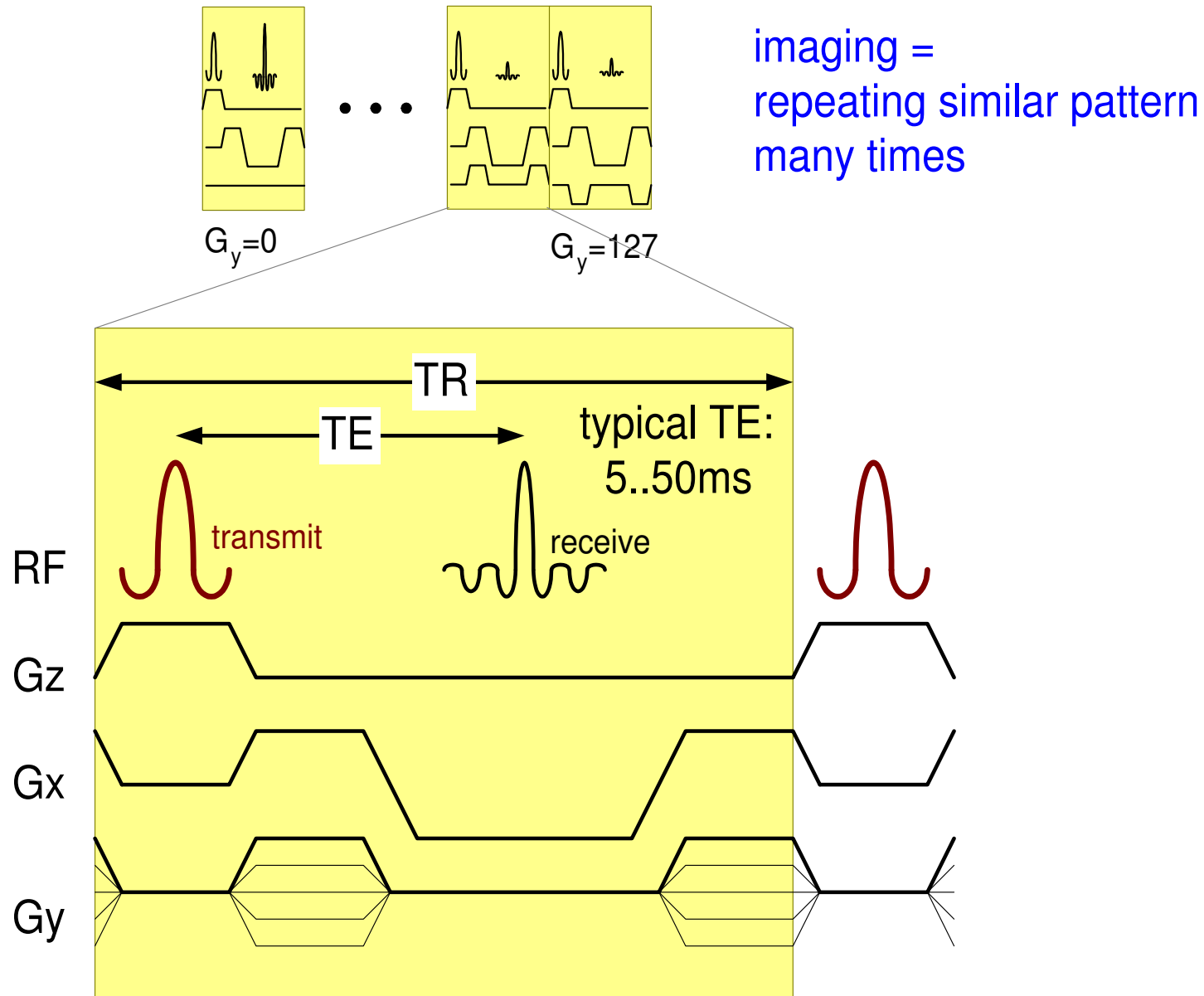


"In the meantime the patient is horrified by the intimidating system, the weird cage around his body and the EKG leads attached to his breast..."

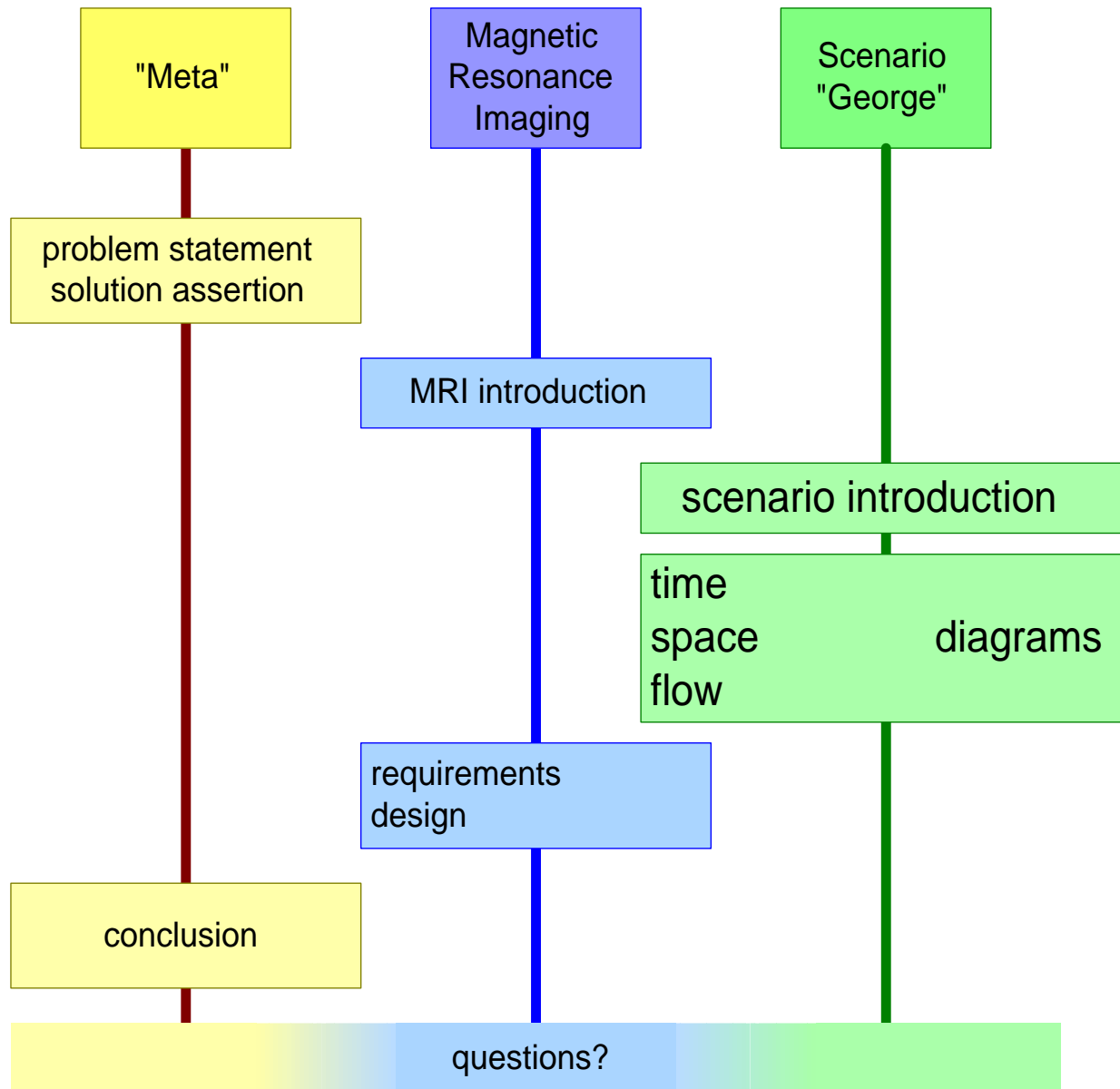
MRI Basic Principles



Basic Imaging Sequence



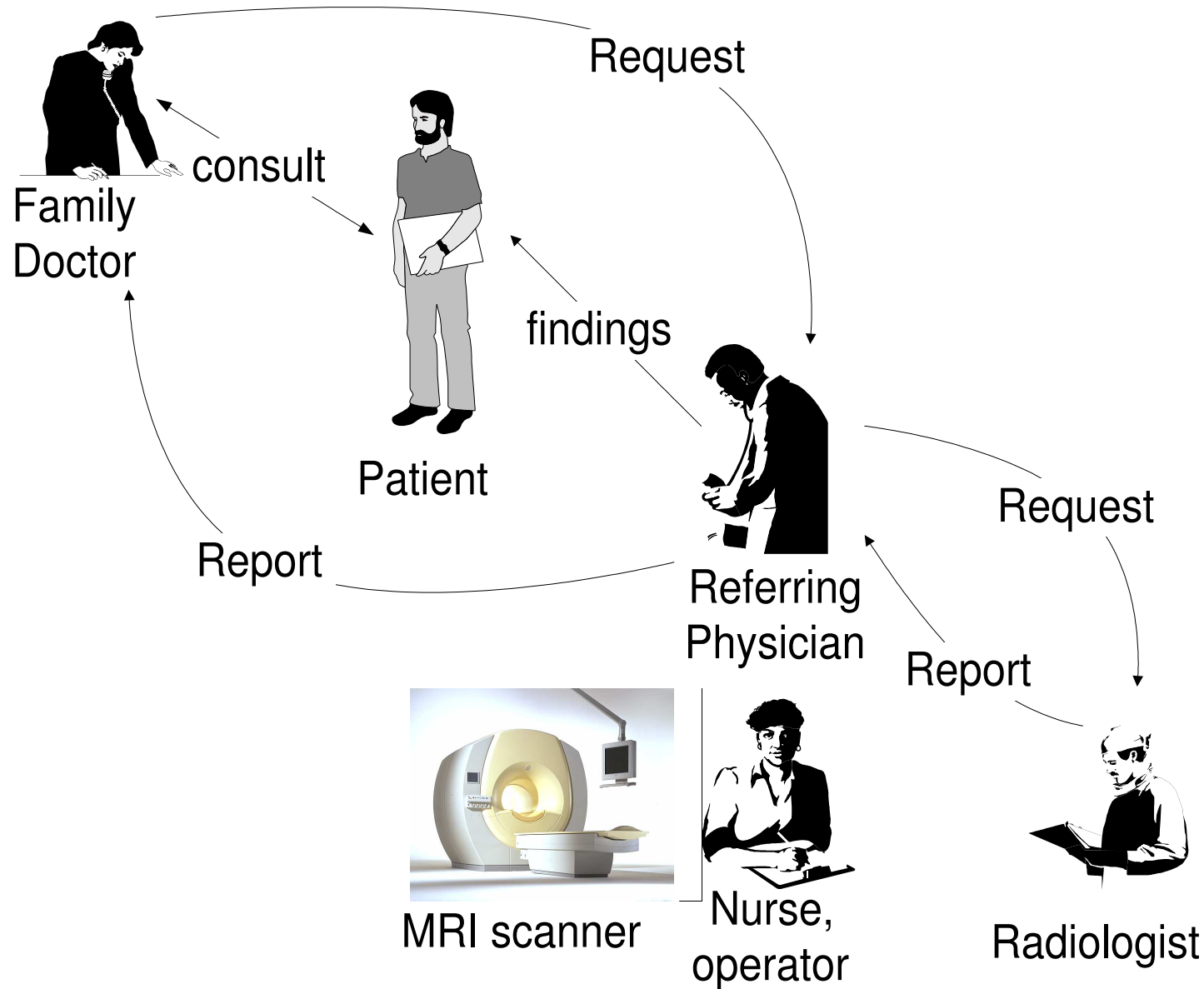
Scenario



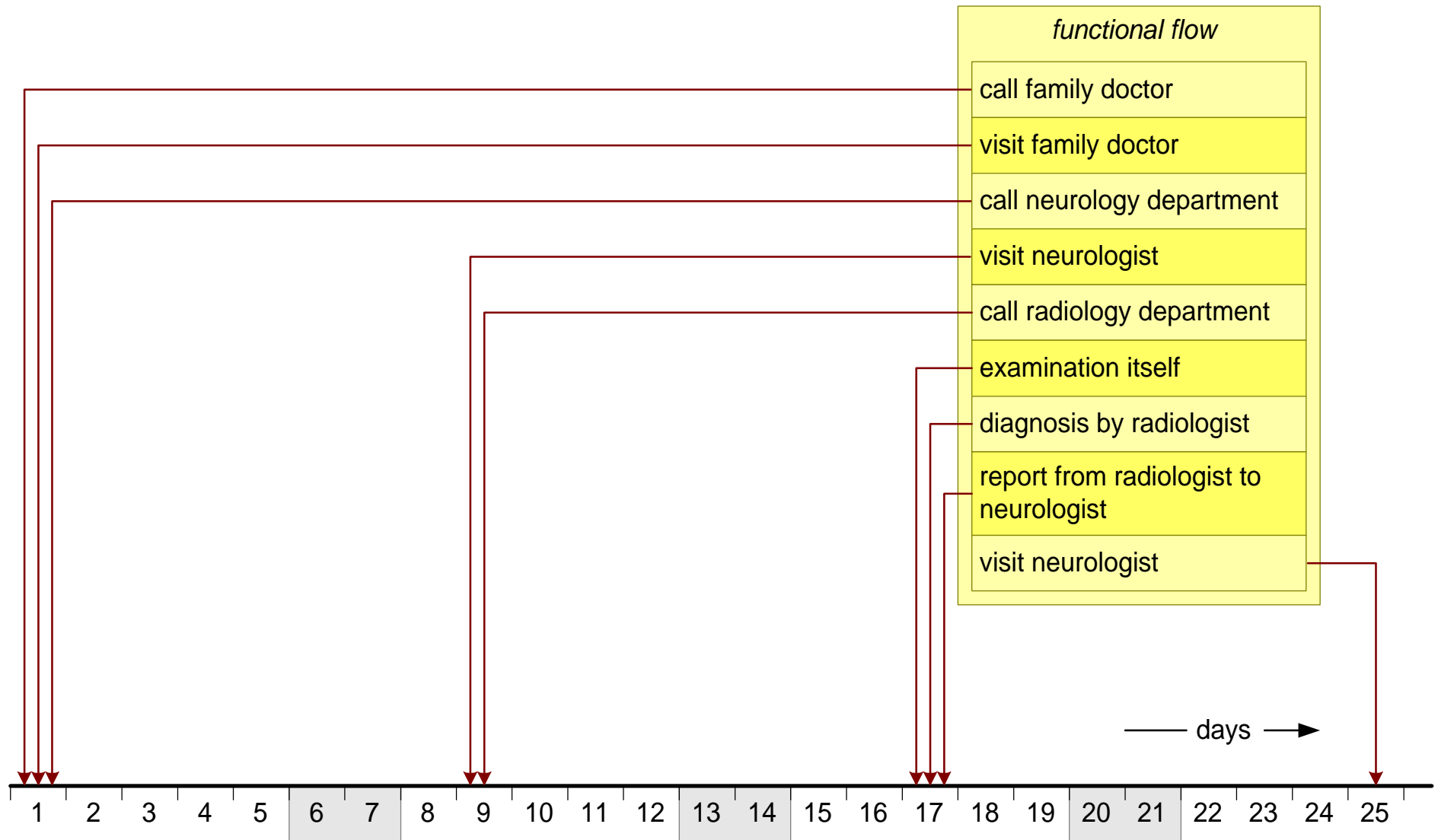
Scenario: Patient George

- Patient George has continuous headache.
- His family doctor has send him to the Neurologist.
- The Neurologist wants to exclude the possibility of a tumor and requests an MRI examination.
- The Radiologists does not see any indication for a tumor.
- The Radiologist sends his report to the Neurologist.
- The Neurologist discusses his findings with the patient and sends a report to the family doctor.

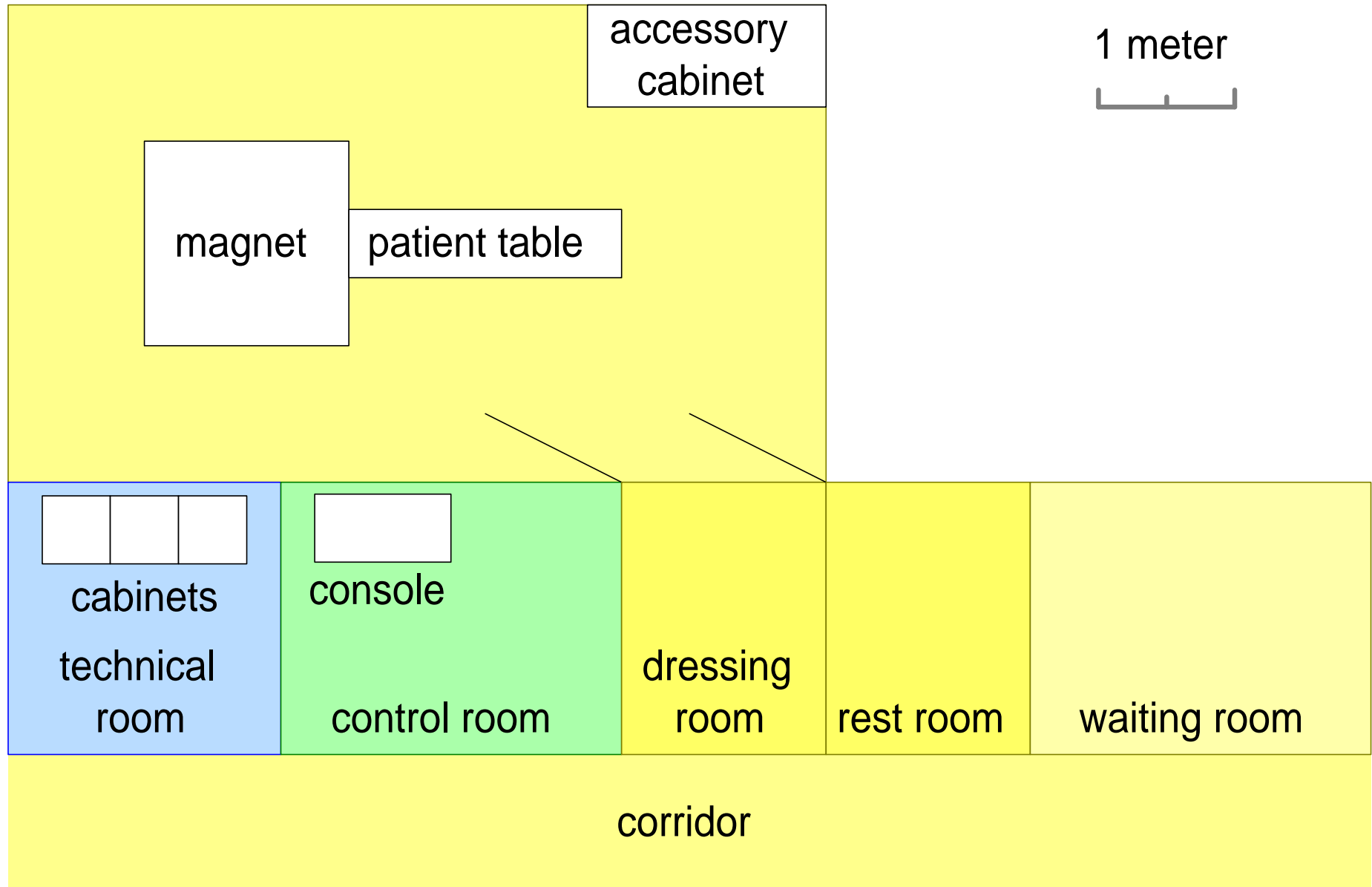
From Complaint to Diagnosis



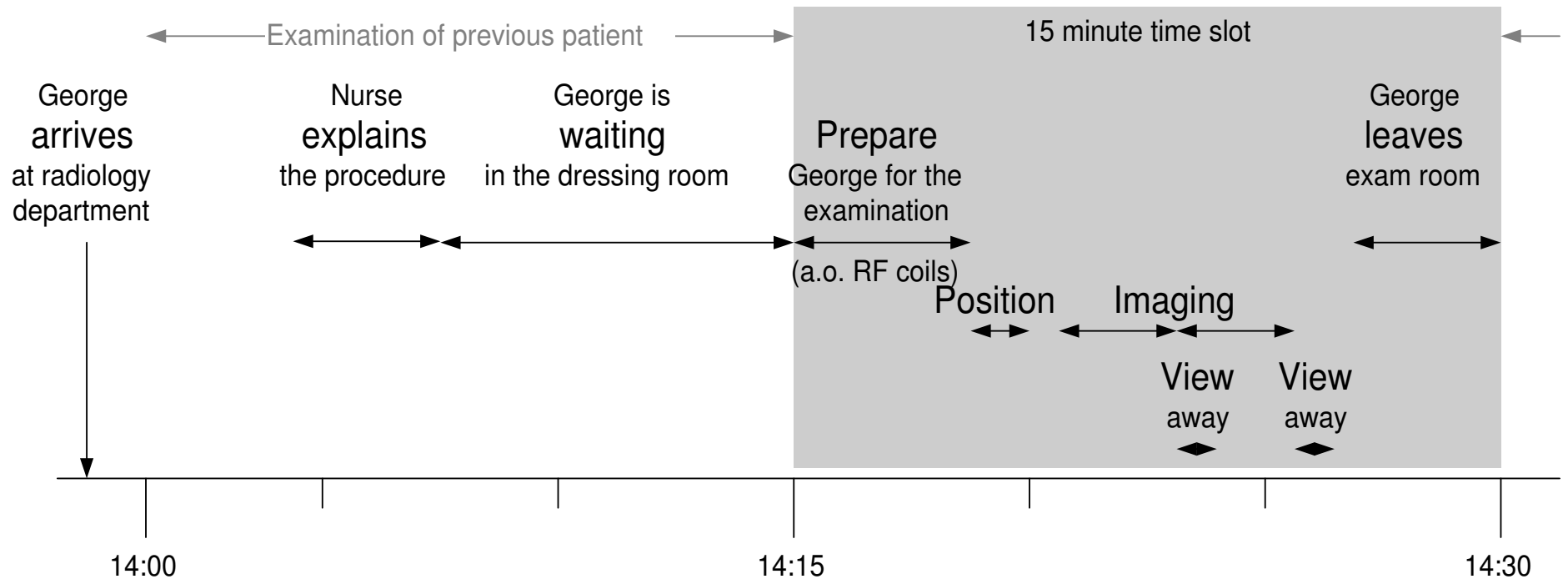
weeks view: from Complaint to Diagnosis



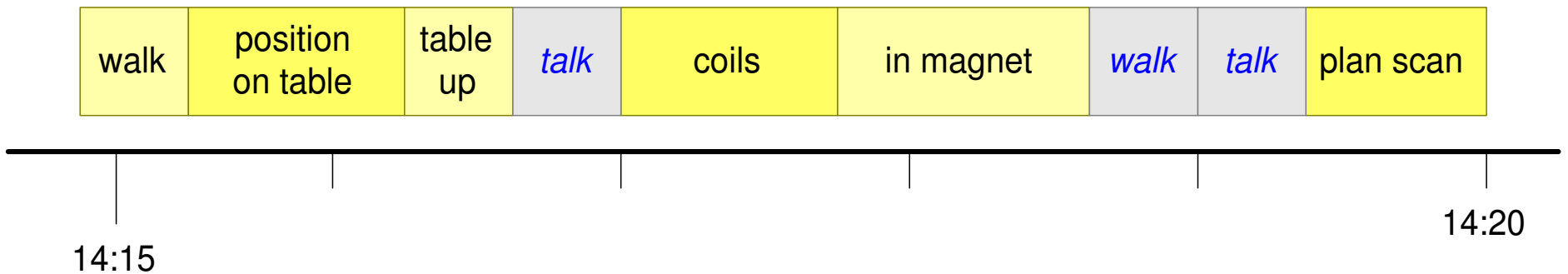
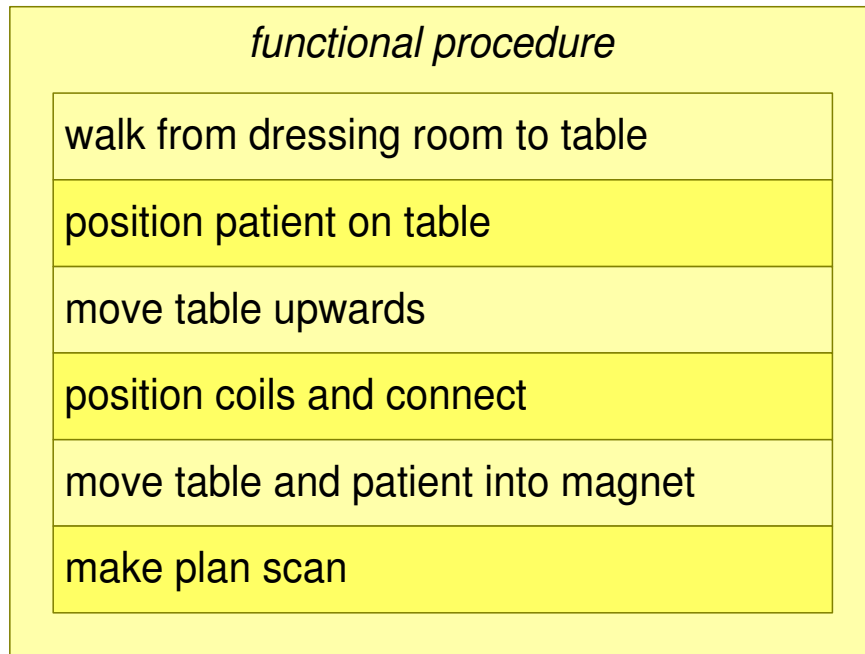
Room Layout



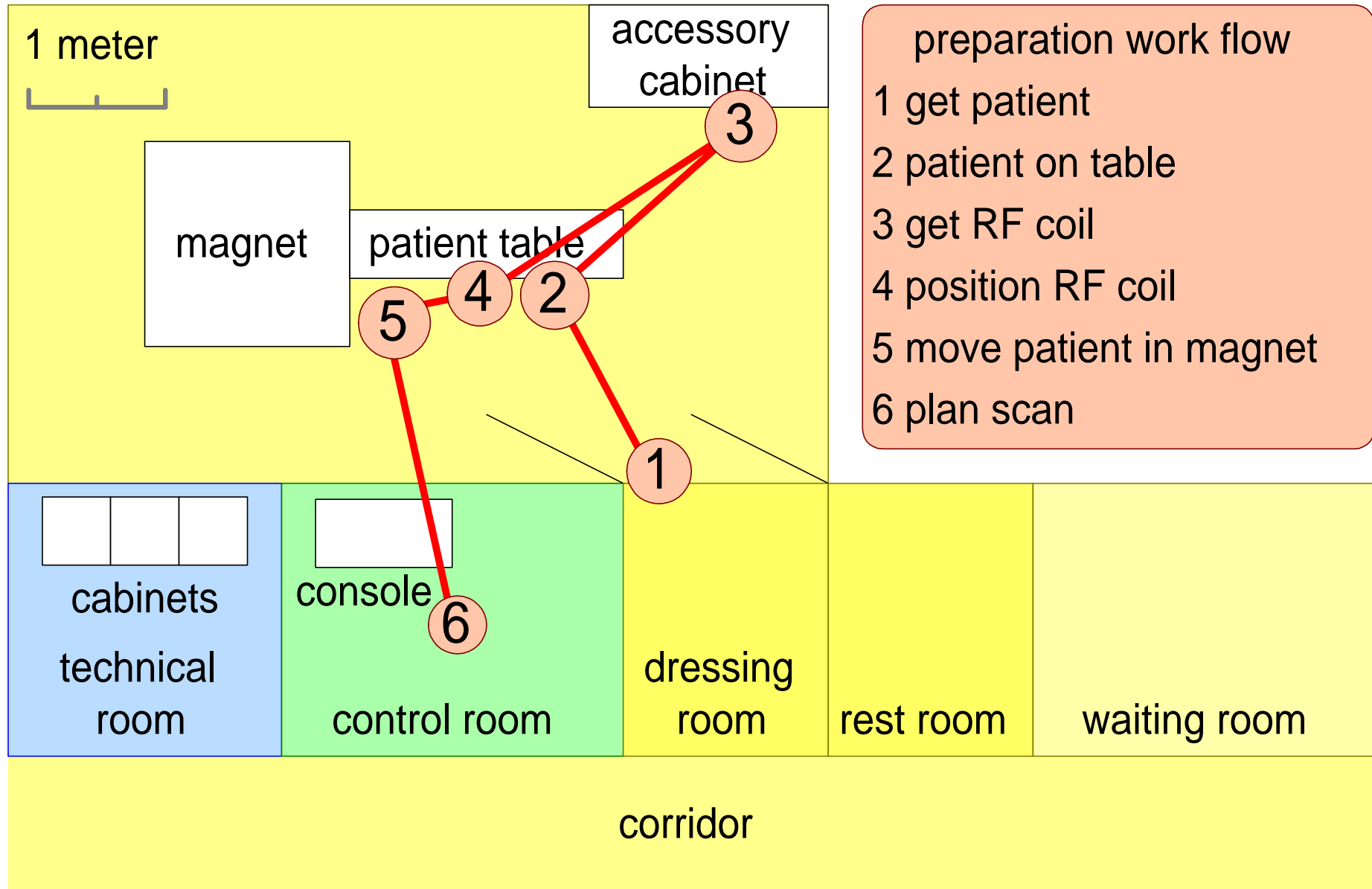
half hour view: Examination



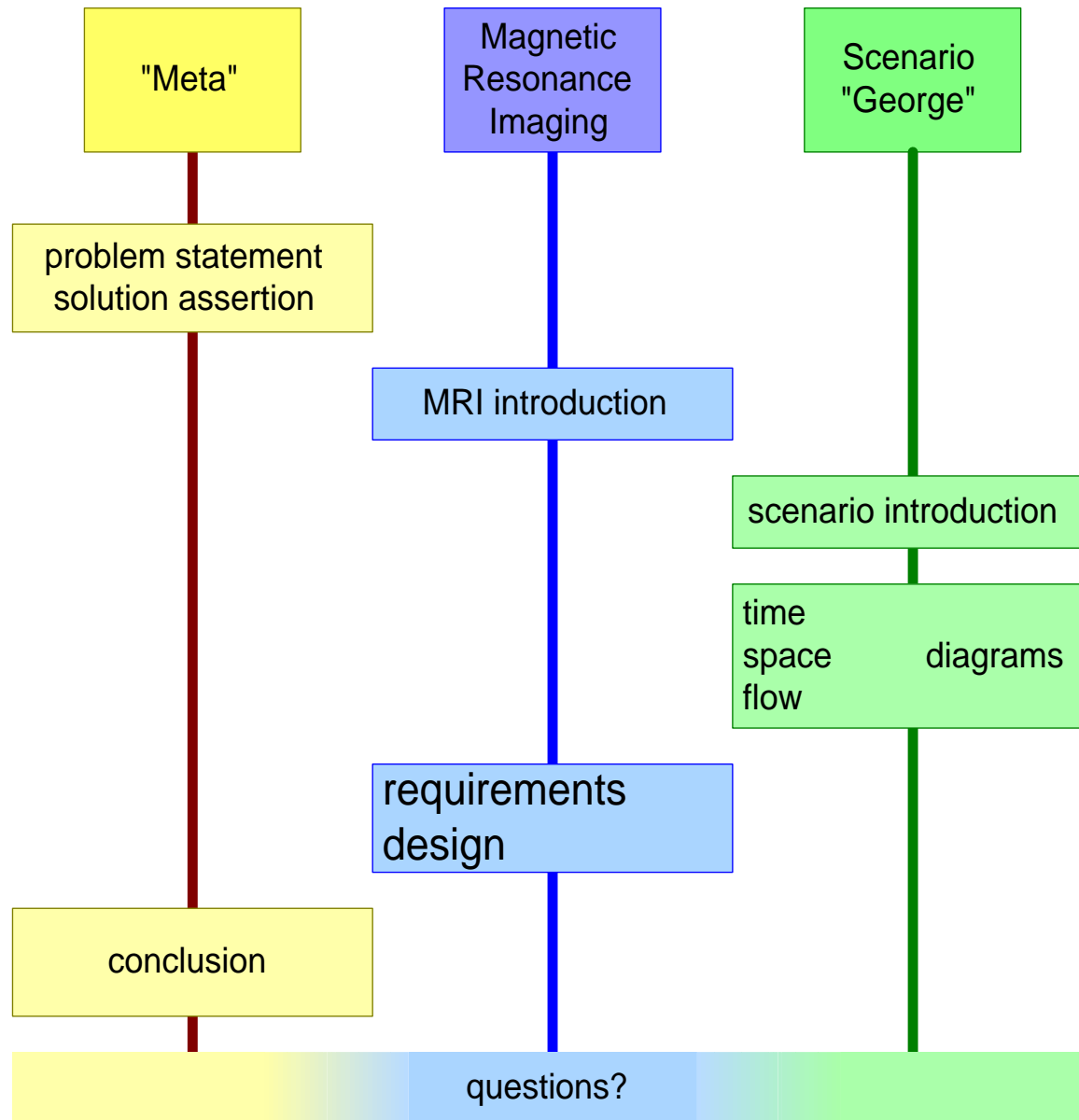
5 minute view: Patient Preparation (1 operator)



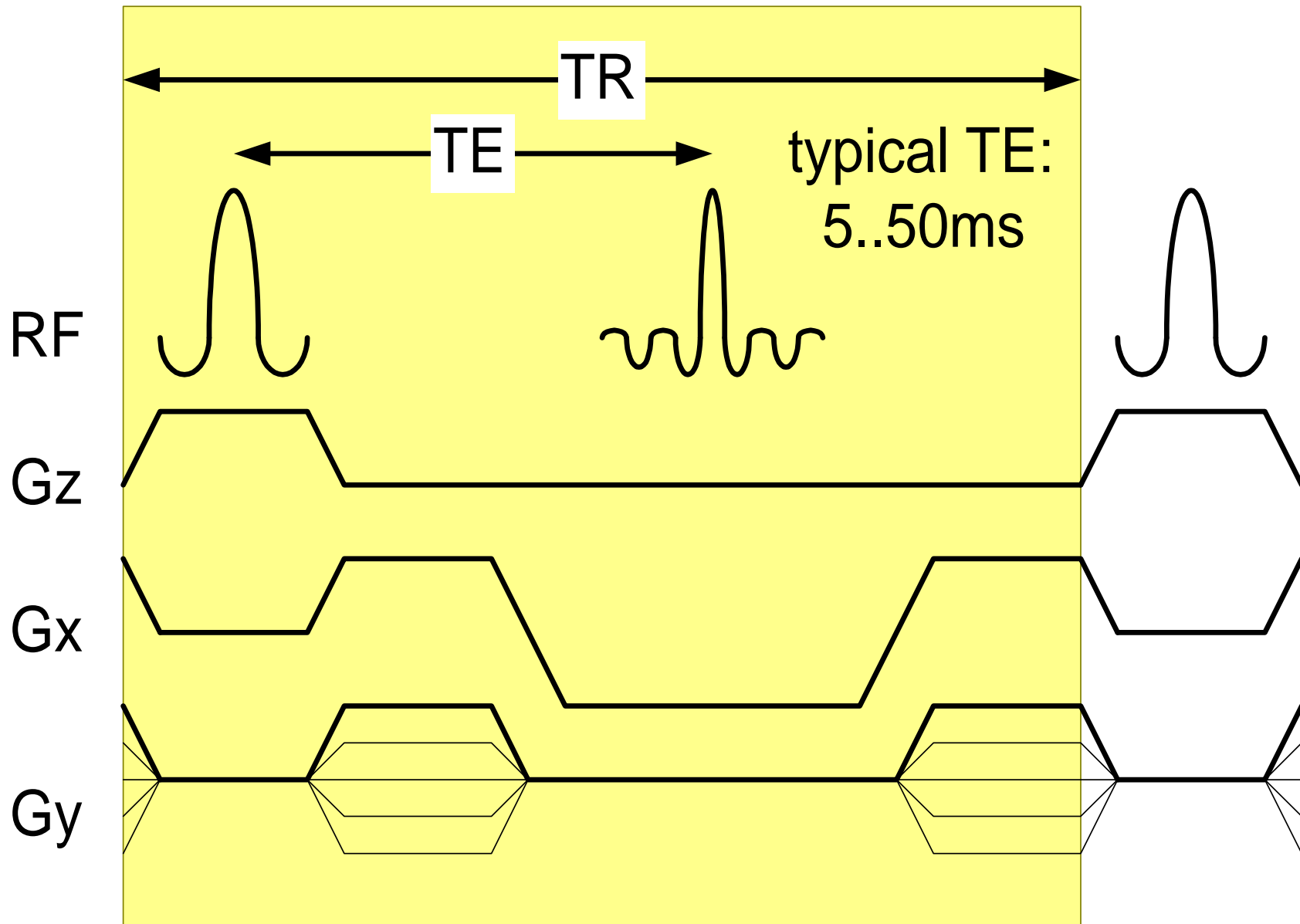
Patient Preparation Work Flow



MRI Requirements and Design



10..100ms view

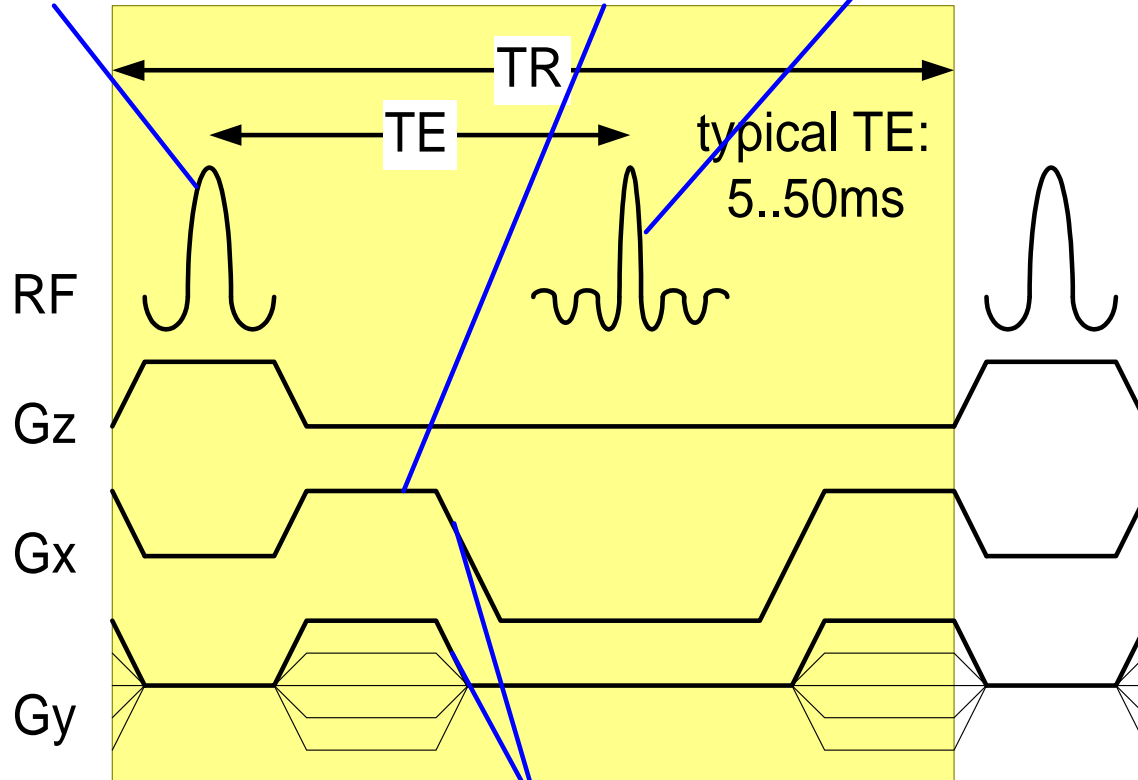


How to Increase Imaging Performance?

shorter RF pulse
more power

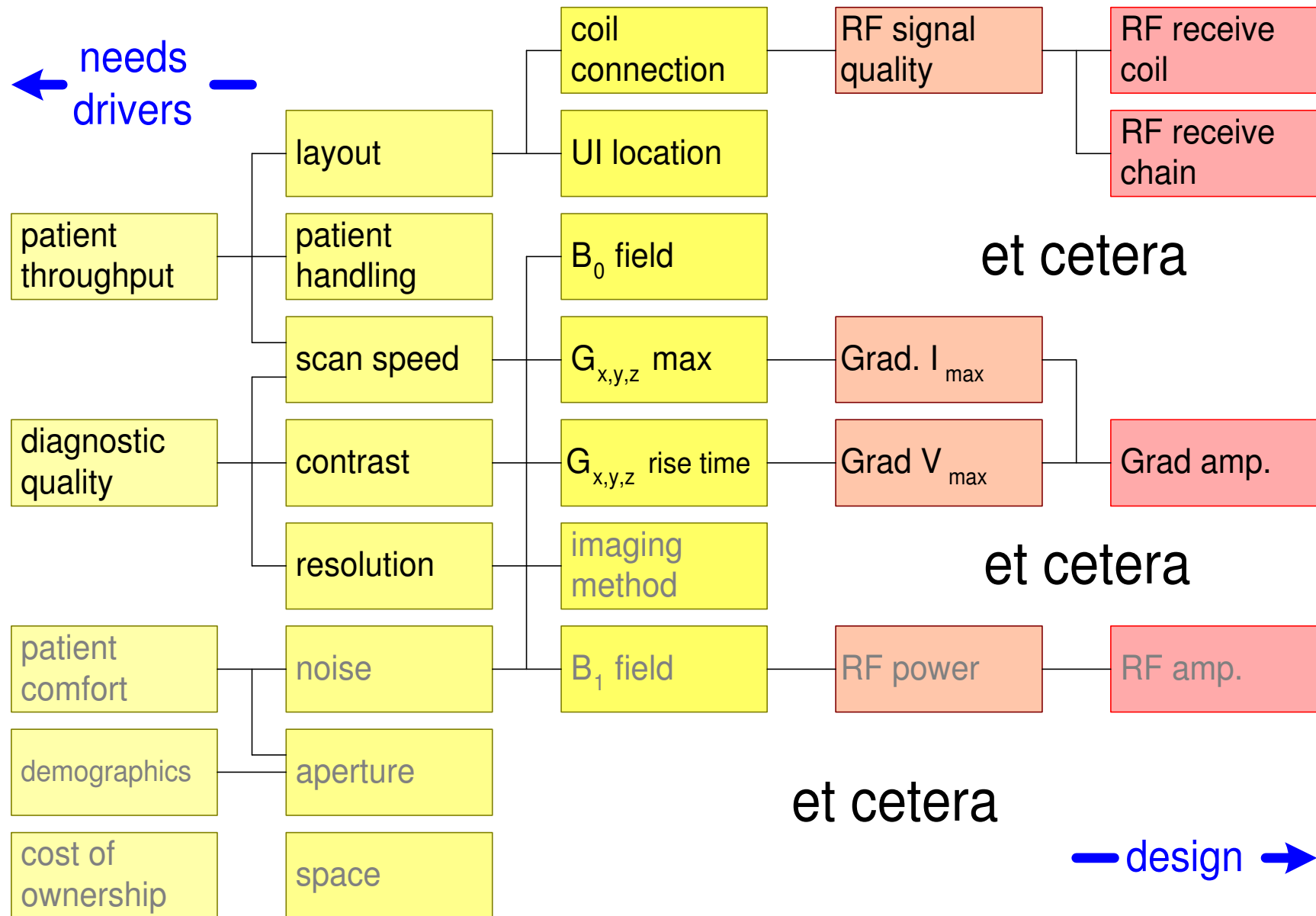
higher gradient
more current

improve SNR
higher B_0

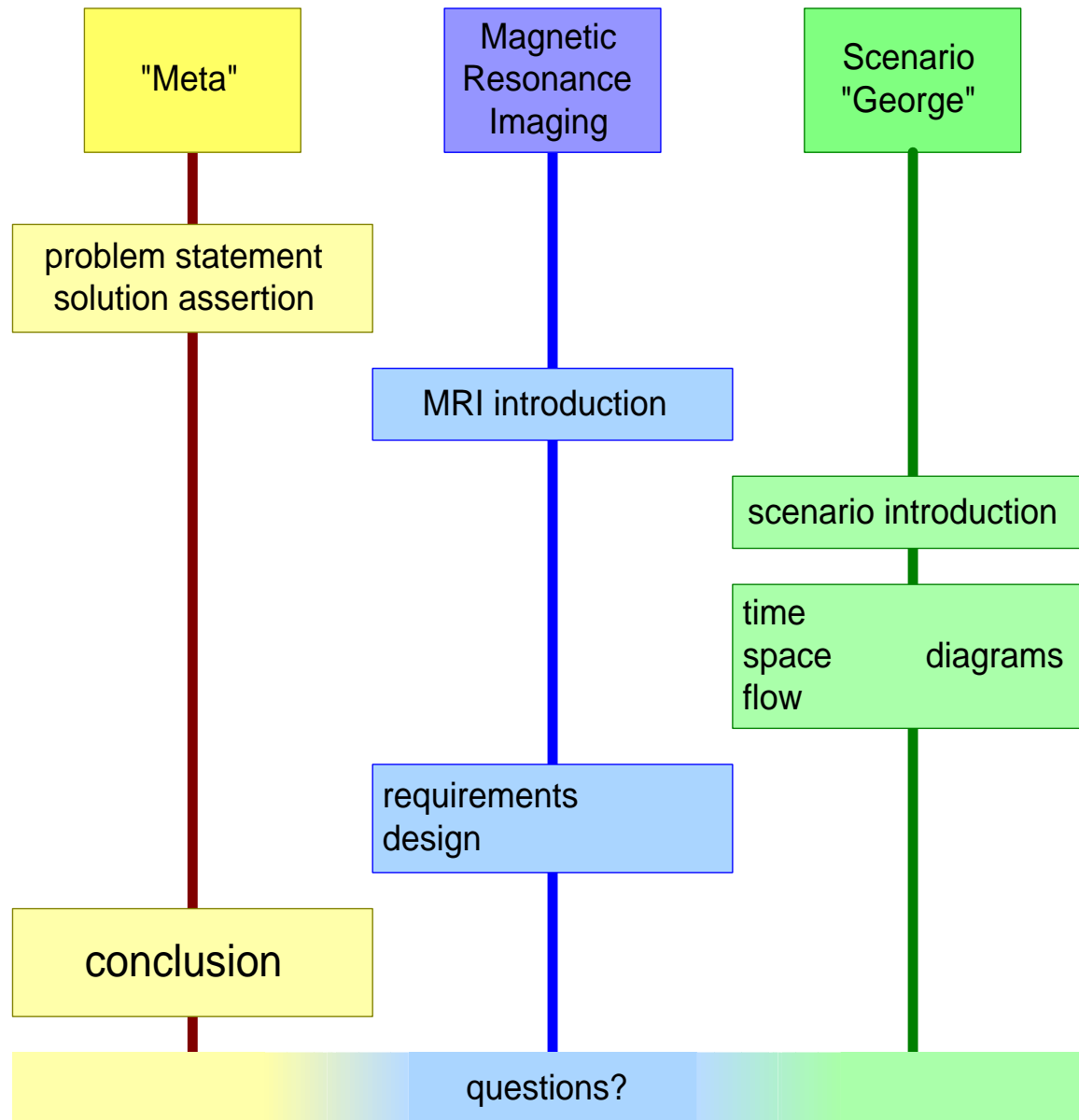


faster gradient ramp
more voltage

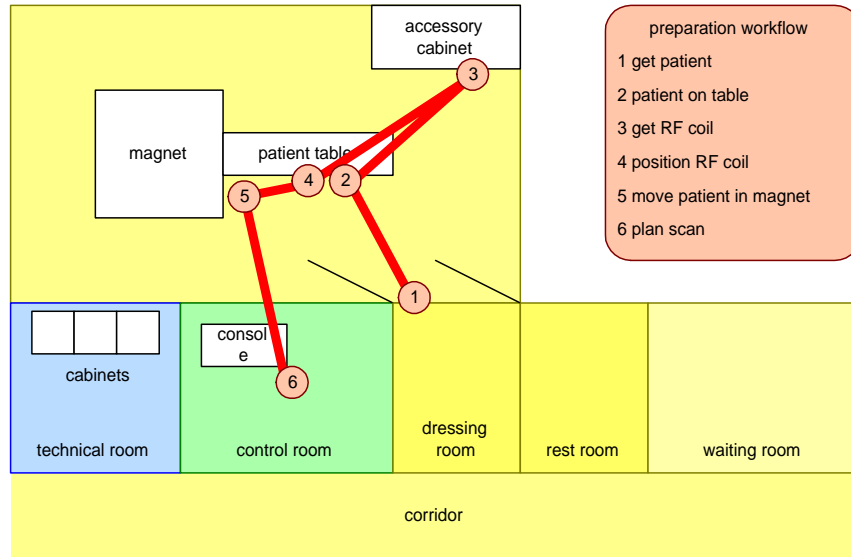
Relations Needs, Requirements, Design Choices



Conclusion



Diagrams Conclusion

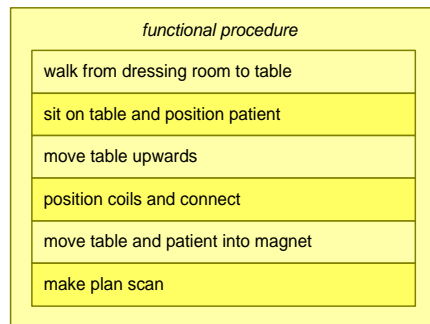


time, space and flow diagrams are:

complementary

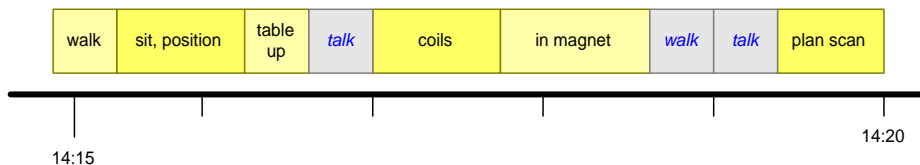
close to human experience

insightful

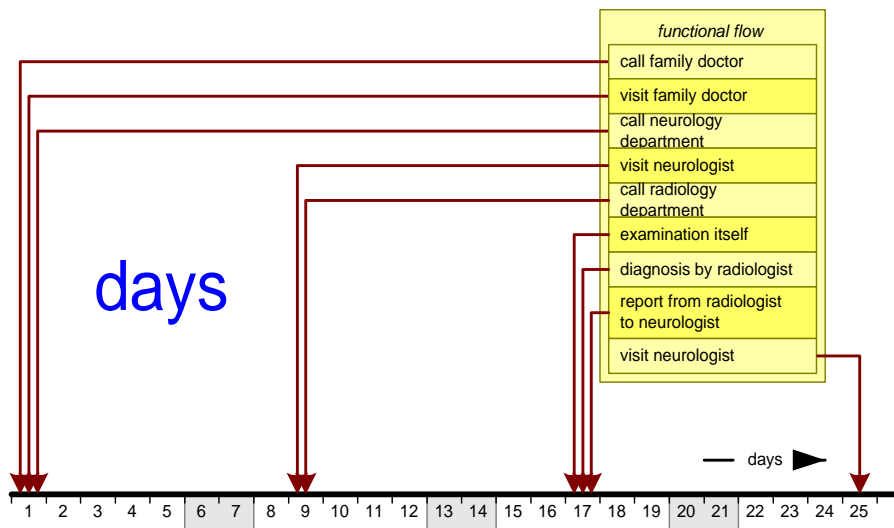


work flow

time line



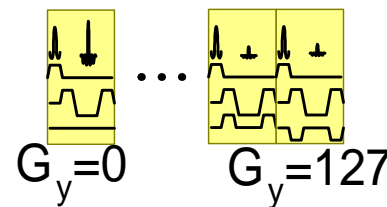
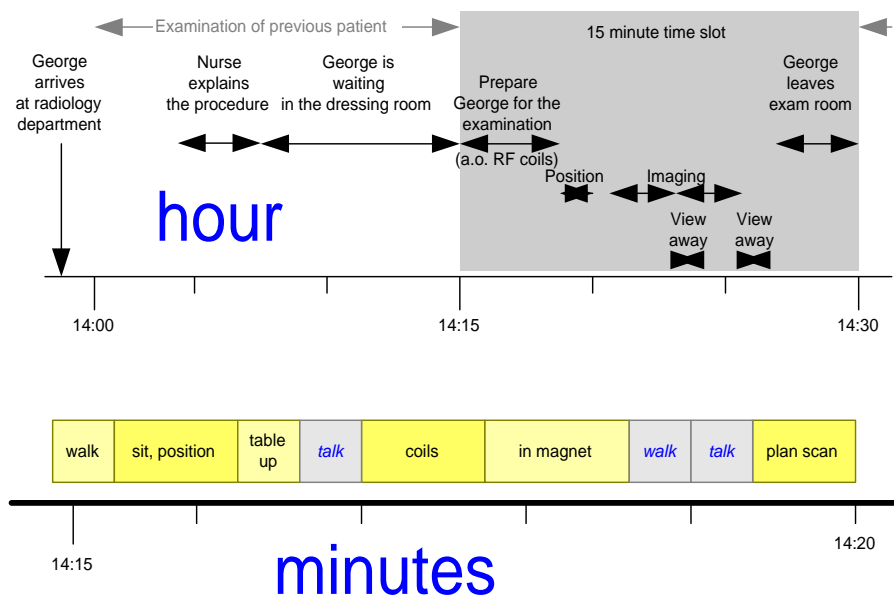
Scale Conclusion



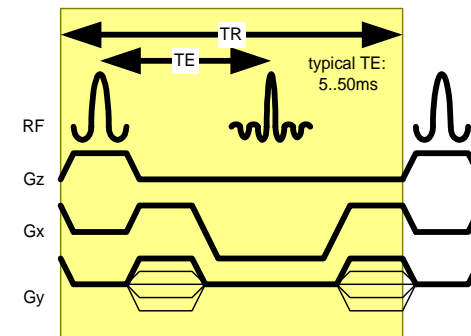
time, space, and flow diagrams are useful in a broad dynamic range.

nano..giga seconds

nano..giga meters



sec..min



10..100 ms

Scenario/Story Conclusion

- Patient George has continuous headache.
- His family doctor has send him to the Neurologist.
- The Neurologist wants to exclude the possibility of a tumor and requests an MRI examination.
- The Radiologists does not see any indication for a tumor.
- The Radiologist sends his report to the Neurologist.
- The Neurologist discusses his findings with the patient and sends a report to the family doctor.

Stories and Scenarios

make discussions concrete

are *means* to understand

are *means* to design