I-AID

INTEGRATED AI DIAGNOSTICS

A REGIONAL EFFORT TO ACCELERATE IMPLEMENTATION OF AI IN HEALTHCARE

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VINNOVA Stockholms läns landsting

WHY AI IN HEALTHCARE?

AI has the potential

to improve outcomes by 30 to 40 percent and reduce the costs of treatment by as much as 50%.

AI will

strengthen medical imaging diagnosis processes

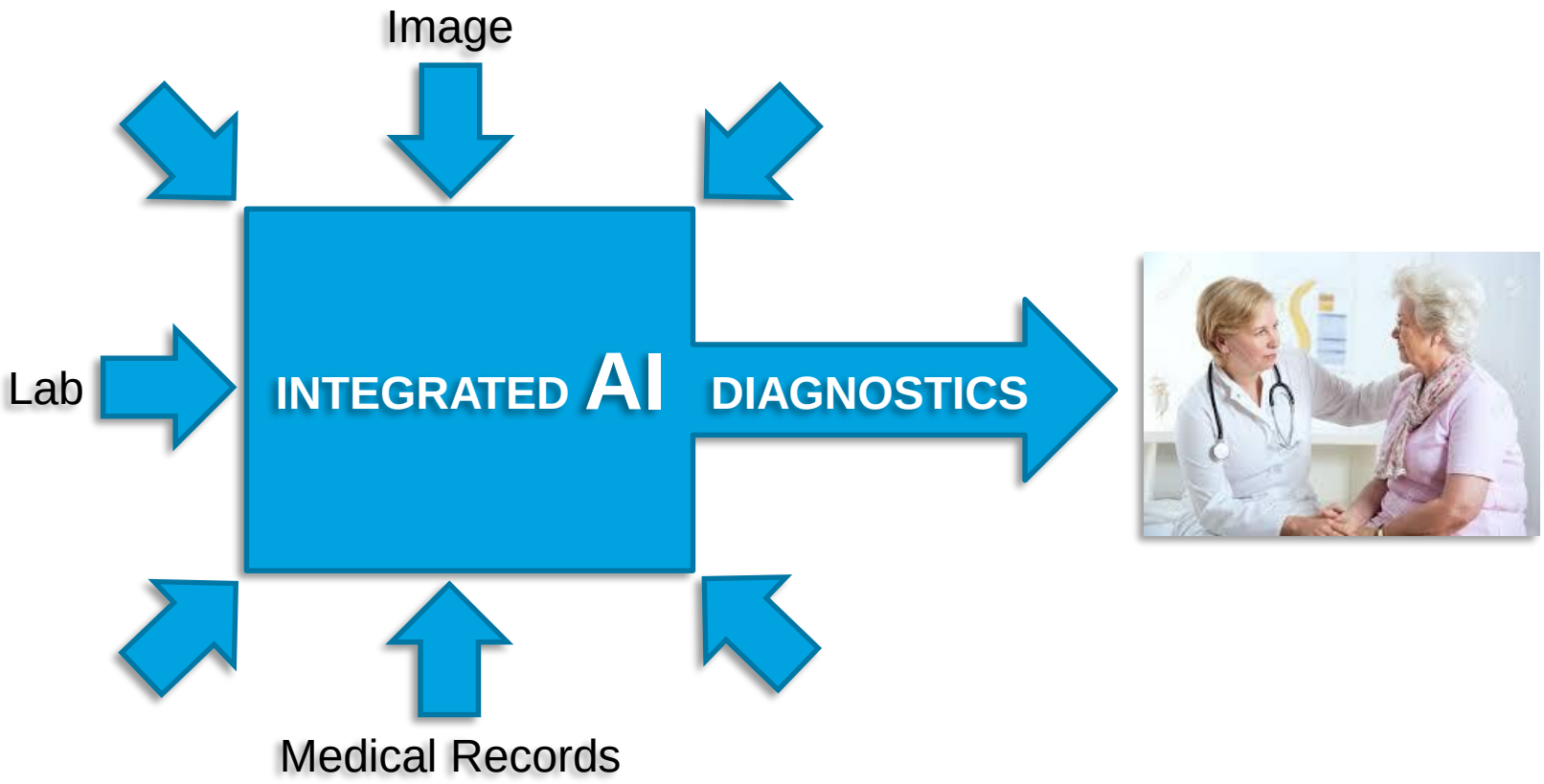
and **using AI solutions for hospital workflows will enhance care delivery.**

The market for AI in healthcare

is projected to reach $6.6 billion by 2021, a 40% growth rate.

2016, Frost & Sullivan

INTEGRATED DIAGNOSTICS



I-AID is a

regional effort to ACCELERATE IMPLEMENTATION of AI in healthcare

I-AID will be

managed from **Karolinska University Hospital, Medical Imaging and Physiology department** in close collaboration with other **Clinical departments, and organizations within Stockholm County Council (SLL).**

PROJECT MANAGEMENT cont.

Styrgrupp:
Juhana Hakumäki (Funktionschef B&F, Projektägare)
Andreas Matussek (Funktionschef KUL)
Anders Jönebratt (CIO, Karolinska)
Anders Wennerberg (Objektsägare B&F K/SLL)
Stefan Vlachos (Chef Innovationsplatsen)
Gustav Alvfelt (Objektsägare Teknik/IT-Bild och funktionsdiagnostik SLL)
Jacob Hellman (Innovationschef SLL)
Jan Svenonius (Chef Karolinska Upphandling)

Projektgrupp:
Birgitta Janerot Sjöberg (Projectleader)
Tomas Borgegård (Coordinator)
Ulf Sundström (Work-package leader IT)
Sven-Åke Lööv (Work-package leader Policy)
Maria Svallfors (Work-package leader Procurement)
Kajsa Müllersdorf (Work-package leader Communication)
Fernando Seoane (MT, IT/AI expert)
Clinical pilot-projectleaders (PIs, Champions)

Scientific Advisory Board:

Peter Aspelin
MD, PhD, Professor Emeritus Radiology Karolinska Institutet KI. Previous Deputy Vice Chanceler KI, Chair Swedish Medical Society and European Society of Radiology Gold Medalist.

Hans Ringertz
MD, PhD, Professor Emeritus Radiology KI, FACR (Hon), FRCR (Hon), F.F.R.RCSI, FHKCR (Hon), Adjunct professor, Associate Chair, Radiology, Stanford University. Previous Chair European Association of Radiology and International Society of Radiology.

Eva Nylander
MD, PhD, Senior Professor Clinical Physiology, Linköping University. Previous Chair/Board member National Board of Health and Welfare (Sports Medicine & Heart diseases) and Swedish representative in European Working Group of Echocardiography.

Referensgrupp: (R&D Head Medical Imaging&Physiology Karolinska, AI-developer, Statistician, Patient, Company representative)

PROJECT GOALS

I-AID has the

ambition to become a center of international excellence for healthcare driven AI development and clinical implementation

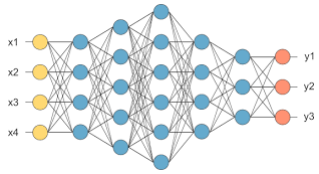
I-AID will establish

competences, policies, processes, guidelines and structures for IT and procurement

and together with external AI-experts

develop and implement AI solutions, improving quality and efficiency of care delivery

PROJECT CONCEPT



AI-developer

Market

Pilot Projects & Process

Clinical need

Selection AI-developer (LoU)

AI-development

Clinical validation Implementation

Building Blocks

WP1 Clinical

WP2 Procurement

WP3 Policy

WP4 IT

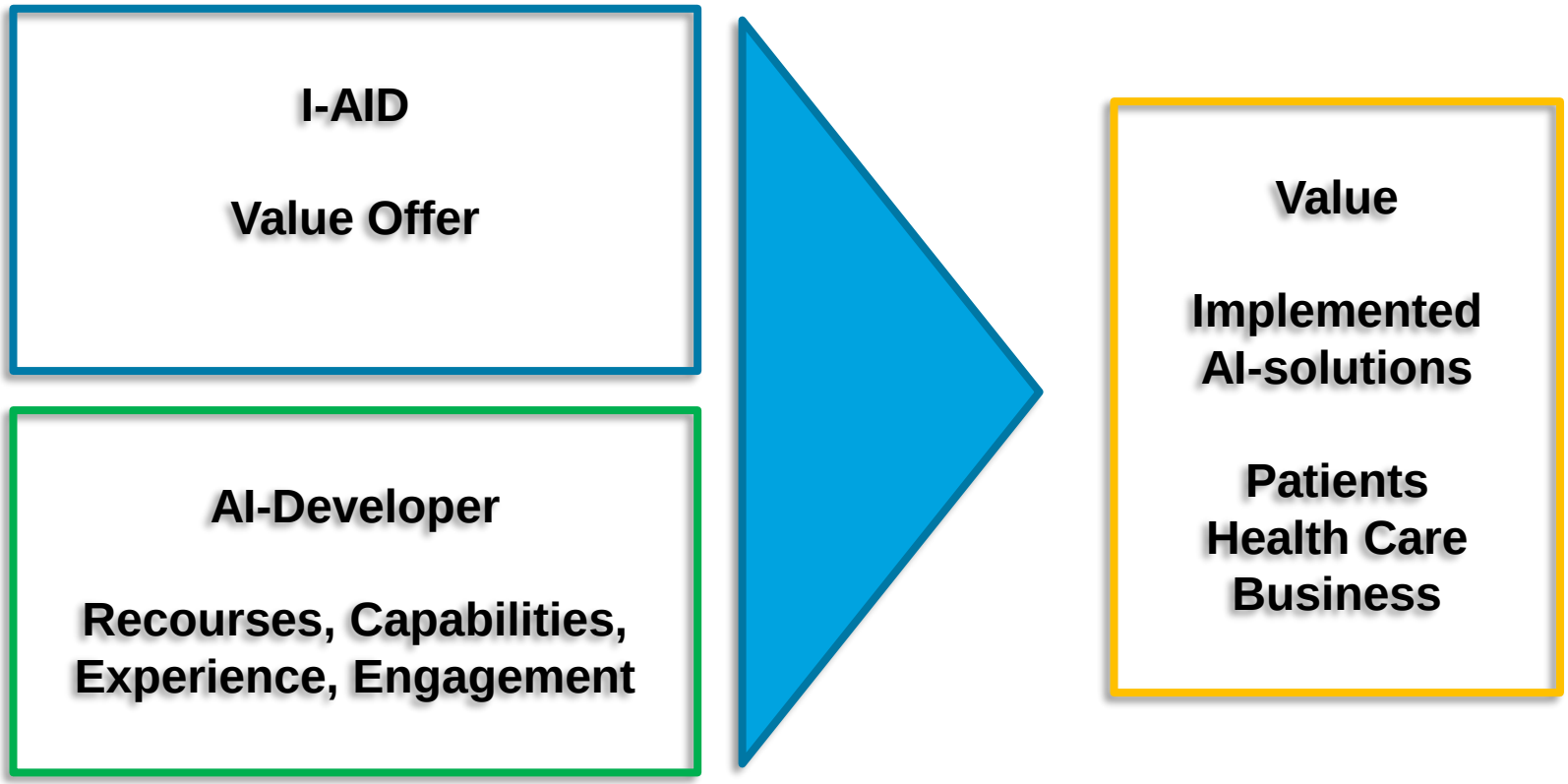
Foundation

Karolinska & SLL
(Experts Clinical, IT, DATA, …)

SLL Medical Imaging PACS (Cloud)

Regional & National Registries

PROJECT CONCEPT cont.



PROJECT CONCEPT SUMMARY

I-AID

will support and facilitate on-going and long-term future research, development and innovation activities at Karolinska and SLL

I-AID

will use procurement as a tool for accelerating implementation of AI

I-AID VALUE OFFER

Opportunities

SAFE and REGULATORY compliant implementation of AI – 'PATIENT FIRST'

clinically validated and implemented AI-algorithm to market

building Karolinska and SLL AI capabilities

Access to

identified true clinical diagnostic needs

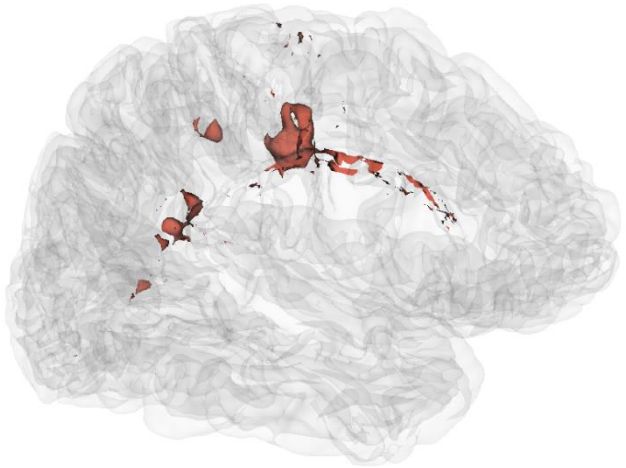
pseudonymized annotated clinical images and data

clinical experts for validation and implementation of AI-algorithm in clinical practice

clinical IT- environment for development and integration within Karolinska and SLL

Automated Detection of Multiple Sclerosis Lesions and Prediction of Contrast-Enhancement

PI Karolinska	Tobias Granberg, (Neuro) Radiology
Clinician	Katarina Fink, Fredrik Piehl
Problems to solve	Volume rendering MS plaque, historic comparison; Exclude need of PVK and contrast in inflam – long-term effect? (Standardized scale for atrophy?)
Modalities	MRI
Annotation	Quantified MS plaque burden. Contrast enhancement and non-contrast images.
Available dataset	Available pseudoanonymized cohort with about 1000 patients, 3 exams each (mean). About 1500 clinical exams/performed year
Foreseen effects	Save time for evaluation, quantitative data, no PVK or contrast (reduce risk and time/money)



T Granberg 2017

CLINICAL PILOTS (2)

AI for counting PCI score for HIPEC patients

PI Karolinska	Chikako Suzuki, Abdominal Radiology
Clinician	Gabriella Jansson Palmer, colorectal surgery
Problems to solve	Surgical exploration is performed in vain – need of improved preoperative staging of mesenterial spread of peritoneal carcinomatosis
Modalities	Mainly CT (some PET-CT and MRI as well)
Annotation	Not yet performed (radiologist evaluation available)
Available dataset	Full datasets (radiology+surgery) available for about 100 patients
Foreseen effects	Karolinska has about 60 HIPEC every year (surgical cost 40 MSEK). If the number of “open and close” could be reduced by 25% (2MSEK/year) by use of AI. The savings for healthcare in general and the patients are much higher.

Sugarbaker’s HIPEC scoring system, known as Peritoneal Cancer Index Score (Curr Oncol. 2011 pr; 18(2):e84-96

CLINICAL PILOTS (3)

AI for RECIST 1.1 (Response Evaluation Criteria in Solid Tumor)

PI Karolinska	Chikako Suzuki, Abdominal Radiology
Clinician	Jeffrey Yachnin, Simon Ekman, Theme Cancer
Problems to solve	Volume rendering in order to evaluate cancer response to therapy (new and target lesions, non-target lesions).
Modalities	CT (some PET-CT and MRI as well)
Annotation	Digital quantification not yet performed.
Available dataset	Data from study Karolinska University based on academic clinical trial studies, for example 150-200 consisting CT of a cohort of 40-50 patients with renal cell cancer or the TREM lung cancer study. (>10.000 CT exams in PACS referred from Oncol each year)
Foreseen effects	Save evaluation time, increase reproducibility of response according to the RECIST definition. Adequately judge response to drugs (new or clinically used). 20% time saving reduce cost with >3MSEK.

CLINICAL PILOTS (4)

Prevention of pancreatic cancer through improved diagnostics in patients with cystic neoplasia in pancreas.

PI Karolinska	Nikolaos Kartalis, Abdominal Radiology
Clinician	Elisabet Axelsson
Problems to solve	Quantification and typing of tumors/cysts (benign, malignification, increase, descrease), and not individualized Lifelong follow-up
Modalities	MRI
Annotation	Images with specific findings, not annotated, but available in PACS
Available dataset	50-100 gathered at Karolinska with CT + biomarkers (complementary European data available)
Foreseen effects	Personalized and stratified follow-ups (increase for patients at risk, reduce when possible). Save time and increase quality.

AI-support in the Diagnosis of Neurometabolic Diseases

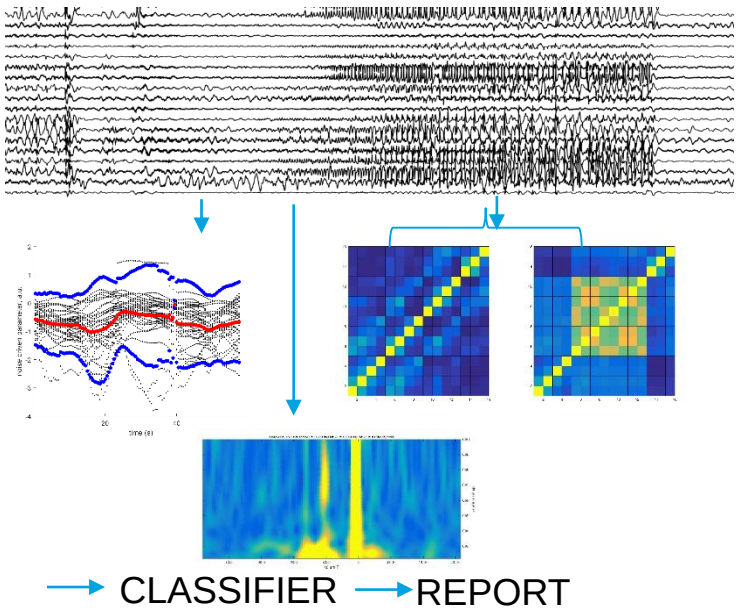
PI Karolinska	Daniel Martin Munoz, Pediatric Neuro Radiology
Clinician	Anna Wedell, Center for Congenital Metabolic Diseases
Problems to solve	Unusual diseases, risk of undiagnosed, treatment increasingly available.
Modalities	MRI / CT
Annotation	Brain Images with specific findings, not annotated, but available in PACS
Available dataset	Unique dataset of clinical terms, genetics, lab needs integration
Foreseen effects	Decision support, quality increase

Thunderclap Headache - Diagnostic Support based on AI

PI Karolinska	Magnus Kaiser, NeuroRadiology
Clinician	Christina Sjöstrand, Theme Neuro
Problems to solve	When CT is non-diagnostic – need of hospital care and lumbal punction if subarachoidal bleeding / aneurysm is suspected
Modalities	CT (Brain)
Annotation	See below
Available dataset	No, annotated study material to be gathered by the PI in an ALF-project 2018; availability from autumn 2018. (other brain images avalable in PACS/BFT)
Foreseen effects	Reduce hospitalization, reduce risk, expense and side effects of lumbal punction & evaluation

Automated Analysis of Continuous EEG

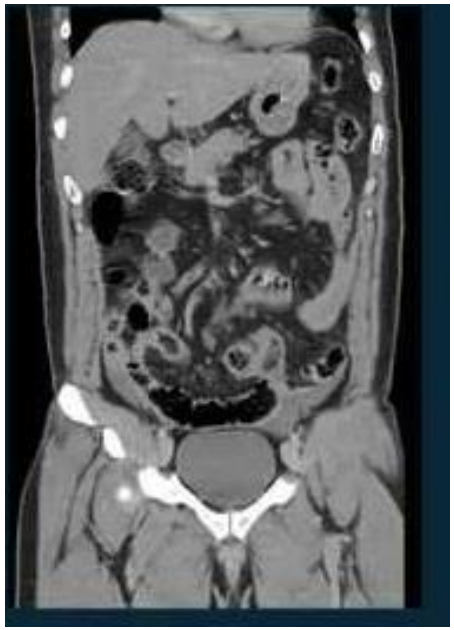
PI Karolinska	Geralt Cooray, Neurophysiology
Clinical coworkers	Neurologists, mainly at neuro intensive care unit
Problems to solve	Shortage of neurophysiologists especially off-time.
Modalities	24 hour continuous EEG registrations in open source EDF/EDF+ - format
Annotation	Patterns of recognition (epileptiform activity, paroxysmal activity, sleep activitiy, asymmetry etc)
Available dataset	To be recorded – 4 continuous registrations per day available.
Foreseen effects	Timesaving, increased availability of continuous EEG evaluation



Modified from Gerald Cooray 2017

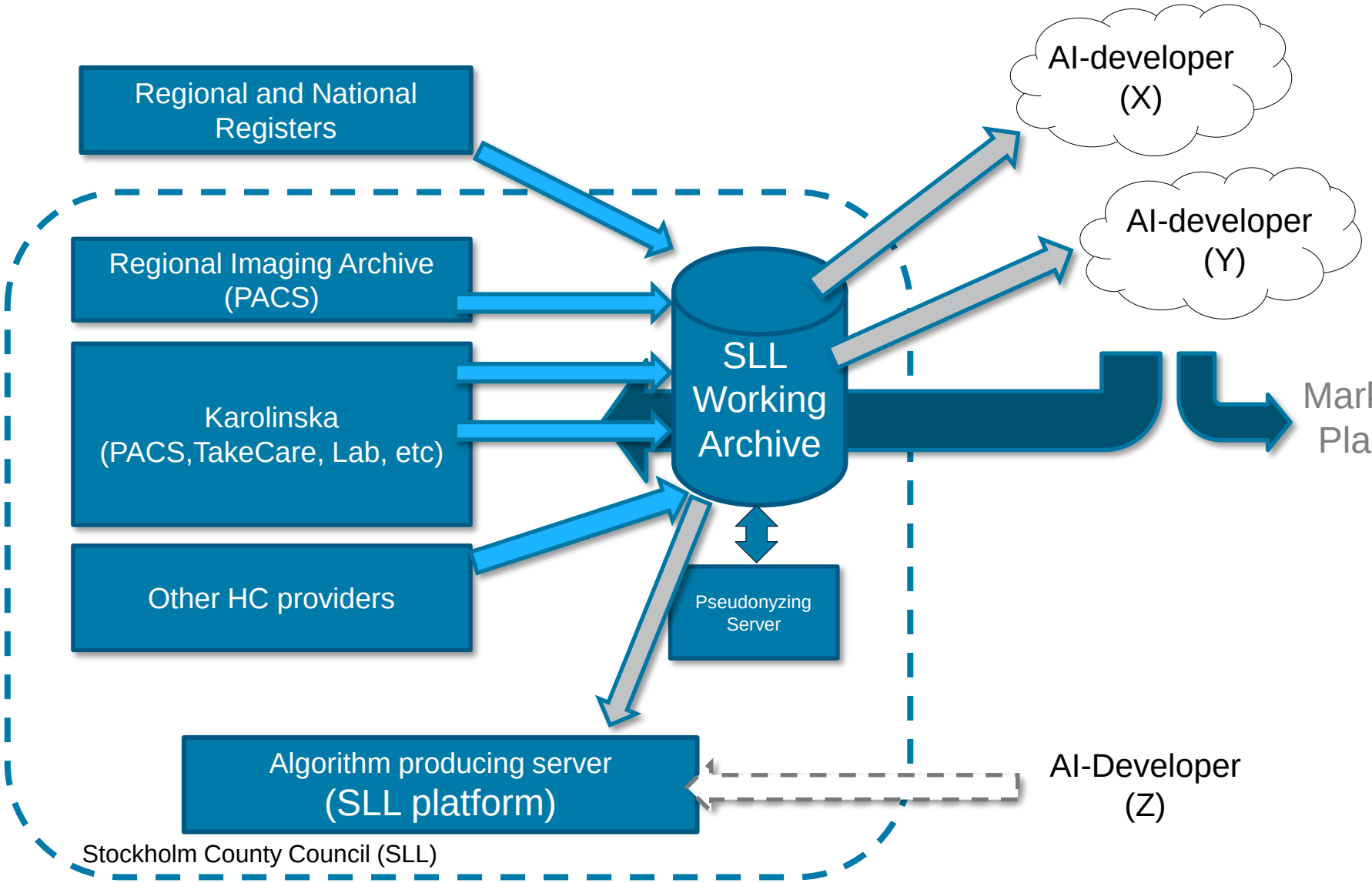
Automated Recognition, Extraction and Annotation of Enhanced Metadata in Medical Imaging

PI Karolinska	Adrian Szum, Radiology
Clinician	Johan Henrikssson, Radiology Ersta diakoni
Problems to solve	Deficient radiology display protocols incl. history
Modalities	(All) – start with CT
Annotation	Initial focus on recognition of anatomical region / organ, image plane and presence of contrast agent (pixel/image data and standard DICOM header data)
Available dataset	All Images in SLL Image Arcive (BFT, SECTRA) or Karolinska PACS (SECTRA) to begin with – pseudonymization available
Foreseen effects	Everyday use; requisite for structured data & reports

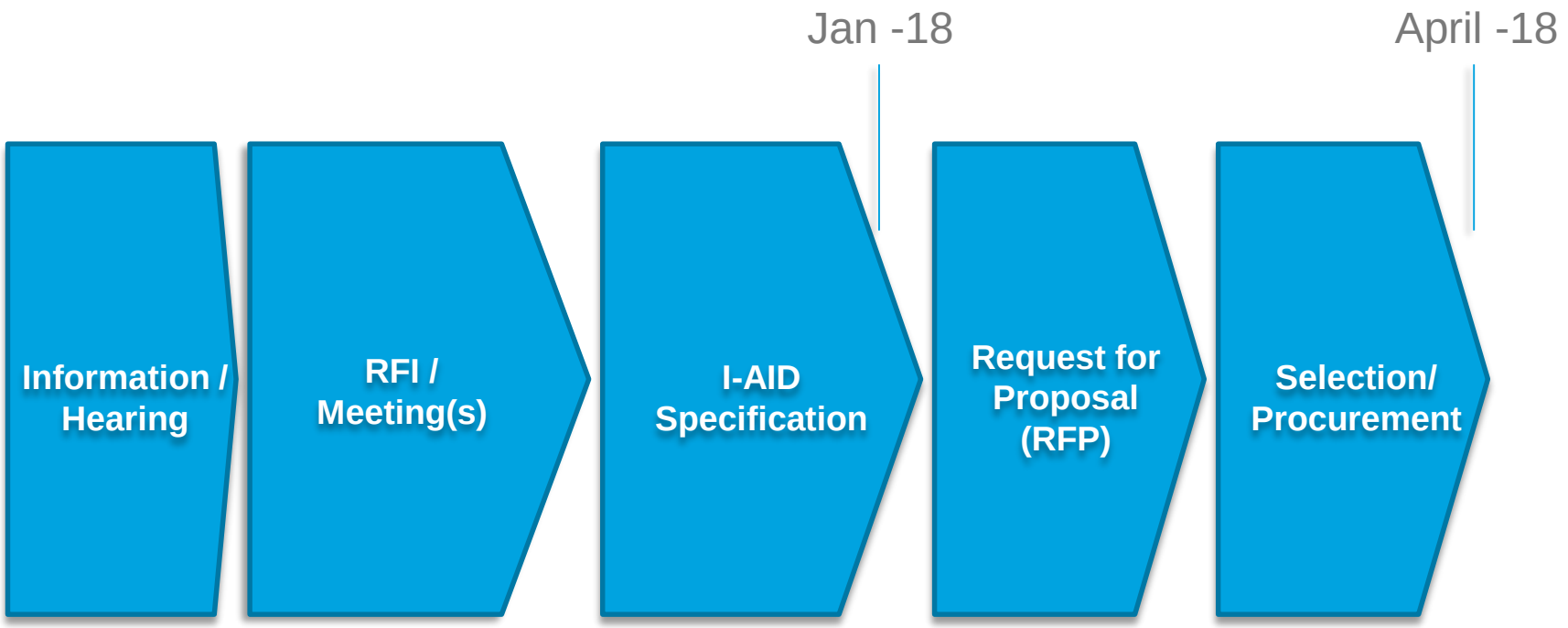


Johan Henriksson, Adrian Szum 2017

ENVIRONMENT FOR AI DEVELOPMENT



prel. PROCESS FORWARD



SUMMARY

Interested?

Sign up for RFI

Specify interest in specific clinical PILOT

Deadline: 14th of November

Email: tomas.borgegard@sll.se

Thank you!

information: www.karolinska.se/iaid