Development of Paediatric Cancer Medicines

'Speeding up Innovation, Saving Lives'

International Childhood Cancer Day – 27 January 2016

Industry Perspectives

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"Over the past 20 years, we have evolved from a view that we must protect children *from* research to a view that we must protect children *through* research"

-Food and Drug Administration Third Annual Patient Network Meeting

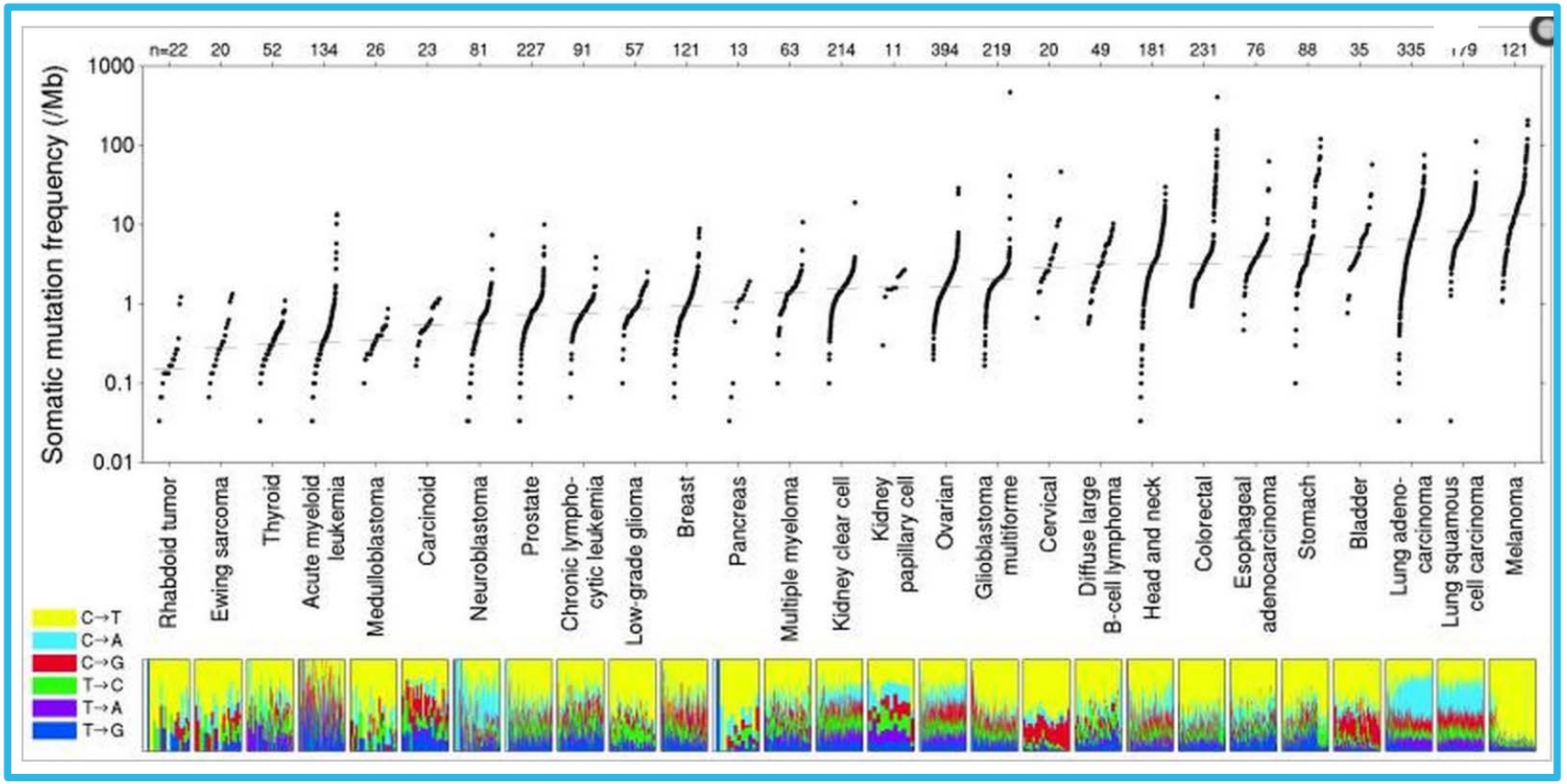
Under the Microscope: Pediatric Drug Development

September 10, 2014

Paediatric Cancers are Different

and may respond differently to targeted therapies

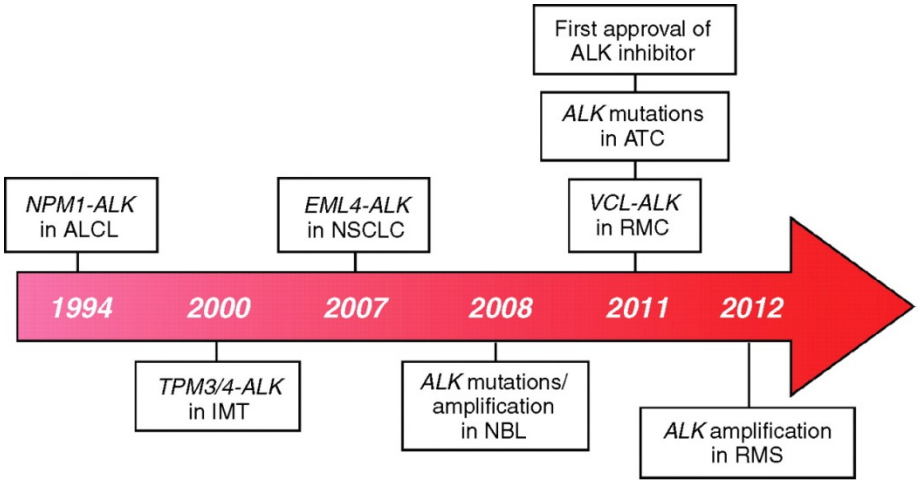
Somatic mutations less frequent in paediatric tumours



Lawrence et.al. Nature 499, 214–218 (11 July 2013)

Paediatric Cancers are Different

…but not always



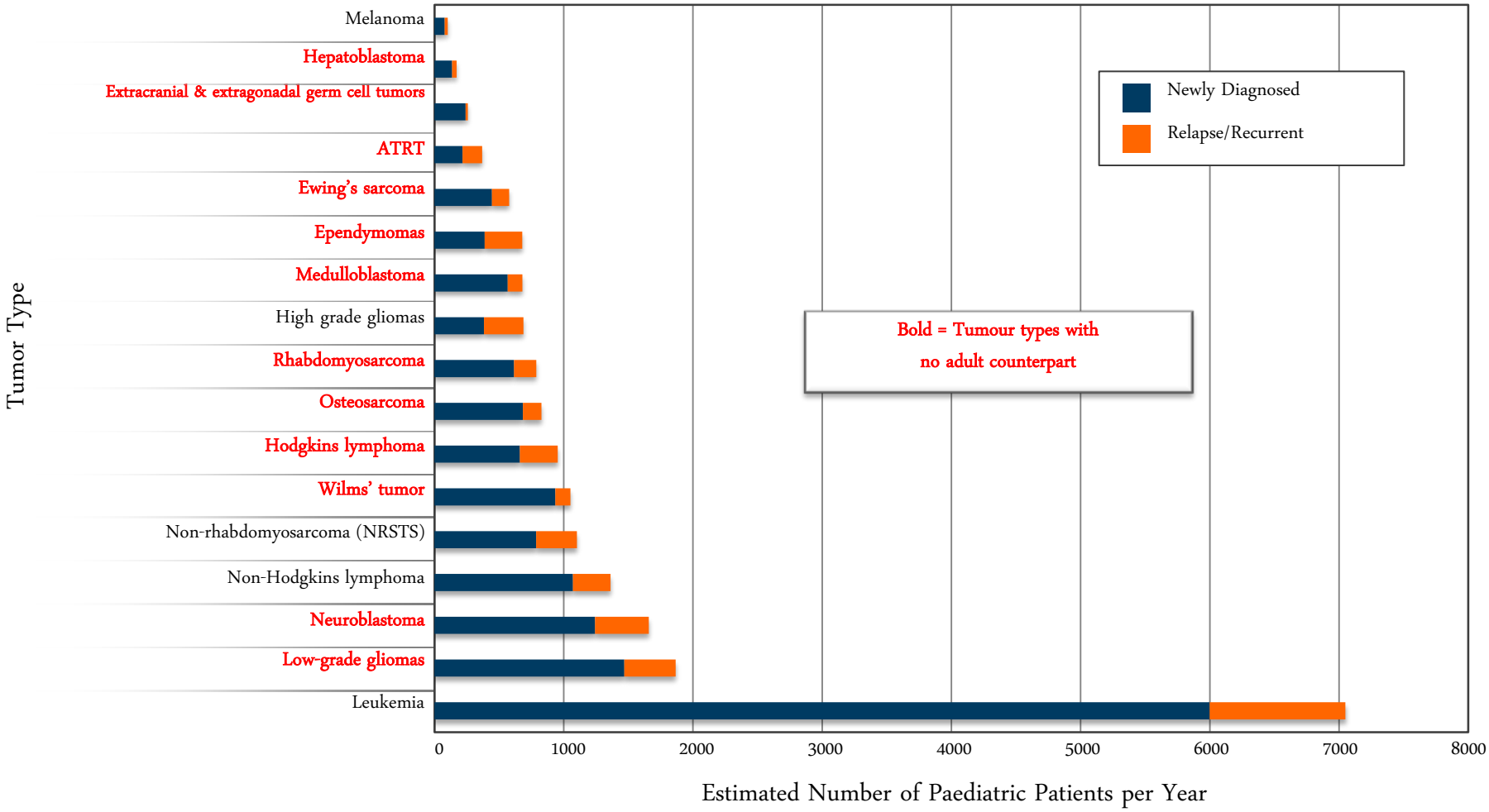
- ALK-driven paediatric tumours
  - Anaplastic large cell lymphoma
  - Some neuroblastomas
- Sarcomas
- Haematologic cancers

ALCL: Anaplastic large cell lymphoma
NSCLC: Non-small cell lung cancer
ATC: Anaplastic thyroid cancer
RMC: Renal medullary carcinoma
IMT: Inflammatory myofibroblastic tumor
NBL: Neuroblastoma
RMS: Rhabdomyosarcoma

Mano, AACR Cancer Discovery June, 2012,

Paediatric Cancers are Rare

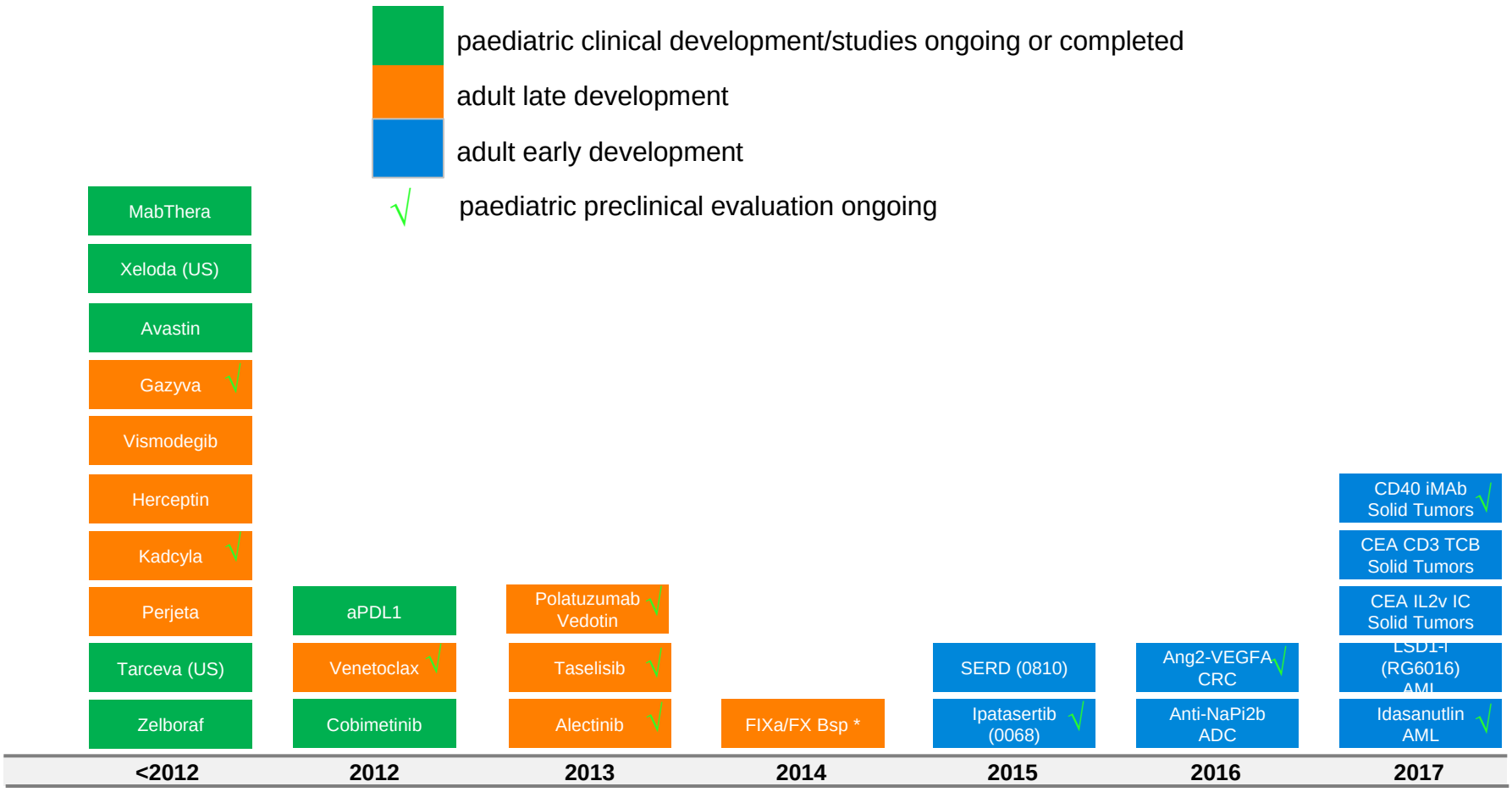
…and distinct entities from those seen in adults



Reference: Incidence rates from International Agency for Research on Cancer's (IARC) Automatic Childhood Cancer Information System (ACCIS) were applied to EU population estimates to obtain patient counts. Note that US SEER 2012 incidence data were used for high and low grade glioma, extracranial germ cell, and translocation renal cell tumors as data were not available from ACCIS. Rate of recurrence is based on literature (see briefing book for references).

How to Develop a Rich Oncology Pipeline?

too many drugs, too few patients (fortunately…)



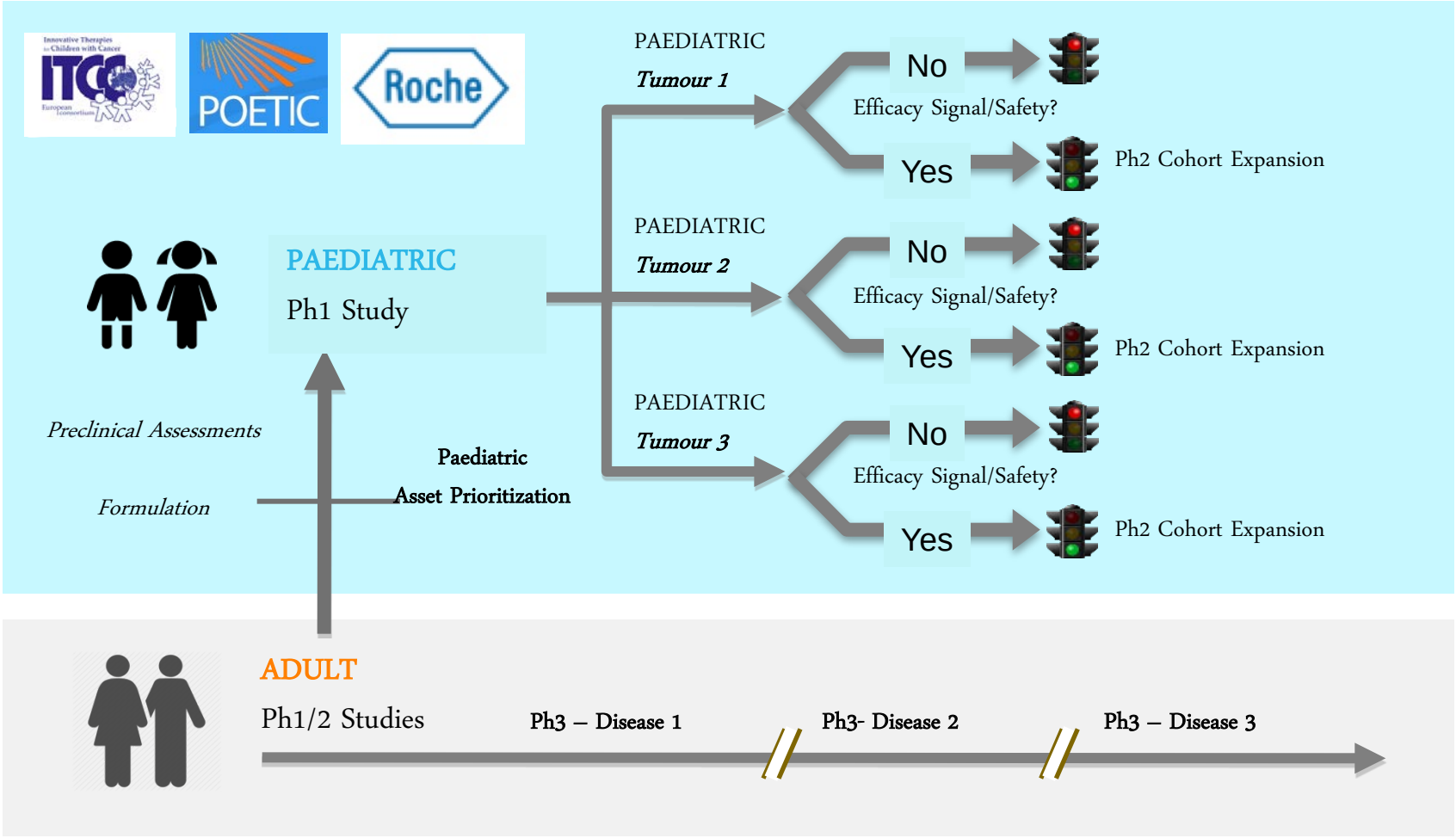
Estimated Year of Start of Phase 3 in Adults

Paradigm shifts are urgently needed in paediatric drug development

Isolated development	Harmonized across industry
Reactive, late	Proactive, early
"Stick and carrot"	Paediatric-centric
Molecule-based in disease context	Mechanistic, biomarker-based in disease molecule context

Innovative Paediatric Trial Design: the iMATRIX

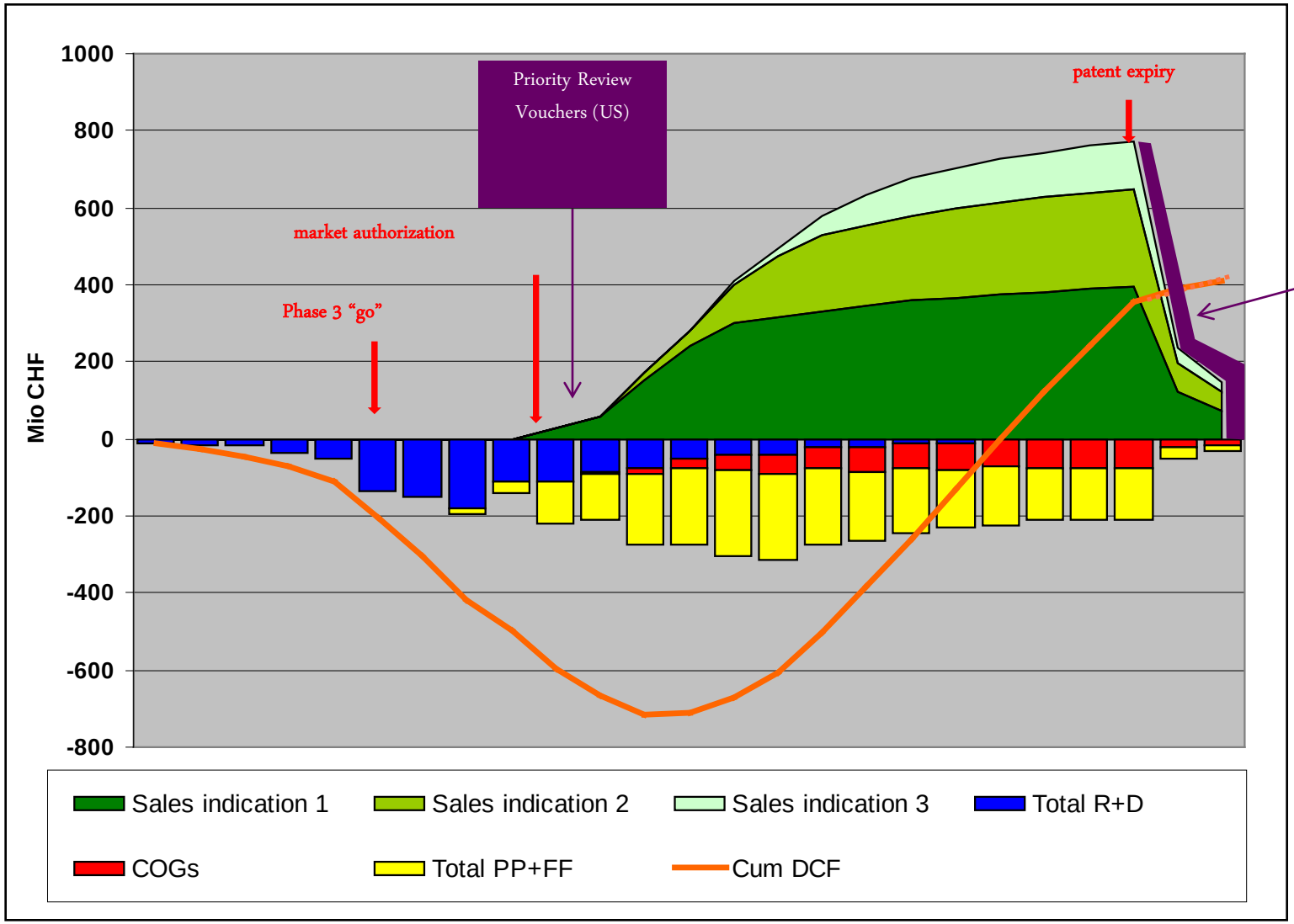
preserve and match rare children to the best available therapies



Ph, Phase of Study (e.g., 1,2,3)

Incentives come too late in the drug's lifecycle

comprehensive drug assessments in children is costly



COGs = Cost of Goods; R+D = research & development; DCF = Discounted Cash Flow

Children with Cancer do not have Timely Access to Safe and Efficacious Drugs

- Mechanism of Action-based paediatric drug development
- Paediatric Assets prioritization across industry's portfolio
- Early entry in children through adapted incentives

Doing Now What Patients Need Next

Children