Pediatric Ultrasound: An International Perspective

Michael Riccabona
Graz
Austria
Disclosure

• Travel support by Siemens
  – several projects with Siemens, no honorarium
    • on optimizing pediatric US applications
• Various projects with GE Healthcare
  – on improving pediatric US applications, no honorarium
• Author / editor of several books
  – *Pediatric Ultrasound, Pediatric Imaging Essentials* ...
  – some images also are from these various books
• Not a “native English speaker”
  – please don’t take every word “literally” ...
Objectives

• To review the present state of pediatric US
  – in different scenarios
    • with respect to its potential & implications

• To revisit potential of modern pediatric US
  – also in the light of increasing use
    • by many different medical specialties
    • for point-of-care imaging
Objectives

• To review the present state of pediatric US
• To revisit potential of modern pediatric US
• To discuss international aspects & perspectives
  – trying to appreciate different settings & needs
    • chances, options & opportunities
    • limitations, risks and threads
  – in the light of different health care systems
  – not neglecting patients’ interests
    = most important opponent to increasing economic aspects
Objectives

• To revisit modern pediatric US
• To discuss international aspects & perspectives
• To deduct common messages & contents
  – necessary for establishing the role of US worldwide
    • standardize US
    • adapt to local needs & opportunities
  – ensure “sufficient” quality
    • variable, depending on local settings & options
  – to also maintain & to further develop high level US
    • as a mainstay of Pediatric Radiology
Objectives

• To revisit modern pediatric US
• To discuss international aspects & perspectives
• To deduct common messages & contents
• To enhance reflections on role of Pediatr Radiol
  – also pediatric US, with respect to present developments
    • in education
    • for application standards
    • concerning quality & diagnostic reliability
    • for (helping in? leading? ... ) developing the future ...
Why this topic?

• Increasing globalization
  – also in health care
    • regulations, companies ...
  – international standards are being created/promoted
    • also for US
      – in many countries these are (partially) missing
  – outreach & help/development programs expanding
    • here US is becoming the biggest player in imaging
  – prerequisite for successful engagement

  *one has to understand the present situation in different areas*
Why this topic?

• Increasing globalization

• (Pediatric) Radiology has neglected US for decades
  – preferring to attend to MRI & CT
    • no wonder one has “lost ground”

• BUT: US = non-ionizing superb imaging tool
  – Pediatric Radiol needs US in its armamentarium
    • as indispensable & requisite imaging tool
    • also in the light of Image Gently Campaign
      - an alternative radiation sparing imaging must be offered
      - must be reliable and applicable to the respective requests
Let’s look at it

... in more detail

– revisit the basics
– check the facts
– discuss all the various aspects
– address the limitations
– consider potential risks & threads
– understand the challenges
– hopefully come up with some perspectives
– develop a plan of action
Pediatric US - Potential

- Diagnostic US has a long history
  - beginning: orienting method
    - derived from submarine sonar
    - "hyperphonography" (1942)
  - one of the first applications
    - cranial bedside US
      - also early therapeutic applications

J. Woo. A short History of the development of Ultrasound in Obstetrics and Gynecology
Pediatric US

- Diagnostic US has a long history
  - beginning = orienting method
  - today = reliable diagnostic method throughout body
    - applicable to all pediatric age groups
    - applicable to nearly all body regions
      = numerous indications validated & established
Pediatric US today

• Diagnostic US has evolved
  – from an orienting to a reliable diagnostic method
  – modern techniques boosted indications & potential
    • high resolution (HR) imaging techniques
      – high frequencies
      – harmonic imaging
      – image compounding
      – noise filters ...
Pediatric US today

• Diagnostic US has evolved
  – from an orienting to a reliable diagnostic method
  – modern techniques boosted indications & potential
    • high resolution (HR) imaging techniques
    • (color) Doppler sonography (CDS)
Pediatric US today

• Diagnostic US has evolved
  – from an orienting to a reliable diagnostic method
  – modern techniques boosted indications & potential
    • HR imaging techniques, CDS
    • contrast-enhanced ultrasound (ce-US)
Pediatric US today

• Diagnostic US has evolved
  – from an orienting to a reliable diagnostic method
  – modern techniques boosted indications & potential
    • HR imaging techniques, CDS, ce-US
    • new flow imaging techniques (e.g., “B-Flow”, “SMI”)
Pediatric US today

• Diagnostic US has evolved
  – from an orienting to a reliable diagnostic method
  – modern techniques boosted indications & potential
    • HR imaging techniques, CDS, ce-US ...
    • three-/four dimensional ultrasound (3D-/4DUS)
Pediatric US today

- Diagnostic US has evolved
  - from an orienting to a reliable diagnostic method
  - modern techniques boosted indications & potential
    - HR imaging techniques, CDS, ce-US, 3D-/4DUS
    - Sonoelastography & therapeutic US options
Pediatric US today

- Diagnostic US has evolved enormously
  - from an orienting to a reliable diagnostic method
  - modern techniques boosted indications & potential
    - HR imaging techniques
    - CDS, ce-US, 3D-/4DUS
    - Sonoelastography & therapeutic US approaches
- are these advances necessary?
  - or just fancy extra tools
  - can they be sacrificed
    - for economic reasons?
    - for enabling POC imaging?
Pediatric US today

• Modern equipment has changed too
  – and constantly is being developed & improved
  • new methods included
  • spectacular imaging became standard
    – should at least in tertiary referral centers
Pediatric US today

• Modern equipment has changed too
  – and constantly is being developed & improved

  also getting smaller & less expensive

• “portable” US, “laptop” US, “handheld” US

• wireless transducers ...
  – at price of less performance?
Pediatric US – needed today?

- Diagnostic US has evolved enormously
  - from an orienting to a reliable diagnostic method
  - modern equipment constantly being developed
  - increasing need for US in spite of CT & MRI
    - radiation protection ("hygiene") & economic pressure
      - less CT = more US needed
      - relatively inexpensive
    - "low resource settings" – increasing need for imaging too
      - should be inexpensive & practical & ...
      - is US the ideal solution for this?
Pediatric US

• Diagnostic US has evolved enormously
  – from an orienting to a reliable diagnostic method
  – modern equipment, increasing need for US

• All this impacts on applications & use
  = new fields for & speculations on future development
    eg., point-of-care US ...
  – discussions arose
    • who is allowed to do US?
    • where should US be performed?
Pediatric US – the reality

• Different settings, needs, environments ..
  – in different hospitals, countries & continents
  • economy
  • resources
  • history & development
  • education
  • medico-legal aspects
  • availability
    – device & trained staff ...
• reimbursement ...
Pediatric US – the reality

• Different settings, needs, environments ..
• Many different specialties perform US
  – varies widely, too
  • sonographers / technicians, (pediatric) radiologist ...
  • pediatricians & family doctors ...
  • (pediatric) surgeon, urologists, orthopedics ...
  • (pediatric) cardiologist & interventionalist ...
  • obstetrician, gynecologist, anesthetist, ER-doctor & staff ...
  • even (non-medical) staff with “only” basic training
    – particularly in low resource settings
Pediatric US – the reality

- Different settings, needs, environments..
- Many different specialties perform US
- Turf battles & discussion on who is allowed ...
  - only radiology? do we “own” US?
    - others also entitled to use US for the benefit of care
    - many new application introduced by non-radiologists
Pediatric US

- Different settings, needs, environments..
- Many different specialties performing US
- All these aspects constitute

*the international perspective*
Pediatric US

- Different settings, needs, environments ..
- Many different specialties performing US
- All these aspects constitute the international perspective

  - quite confusing
    - sometimes difficult to understand

  - quite challenging
    - adequately address changes & potential
    - adequately consider risks & threads ...
Some facts

• (Pediatric) Radiologist have neglected US
  – focused on & attended CT & MRI
  – abandoned US, lost interest & engagement
    • did not invest in development & research ...
    • how many practically perform US (in USA)?
      – who is fine with scanning?
Some facts

• Use of (compact) US has widened
  – development driven by army
  – today widely accepted
    • particularly by non-radiologists
Some facts

- Use of (compact) US growing
  - development driven by army, today widely accepted
- increasing economical aspects & reimbursement issues
Some facts

• US = becoming the modern stethoscope
  i.e., “sonoscope”
  – for basic patient assessment
    • available in many emergency rooms & rescue cars
  – also for / in medical education
    • taught & used already at university level
  – for many specialties
    • not just radiology & a few others
Some facts

- Use of US has increased generally
  + in many new areas (MSK, GI, anesthesia ...)
  - in USA particularly in private offices, not so in Austria
- depends partially on reimbursement policy / economics
  + access to other imaging tools

Some facts

• US being discovered as ideal point-of-care (POC) imaging option
  – portable systems
    • can easily be used anywhere
    • relatively inexpensive
  – wireless connections
    • available around the globe
    • enabling remote reading of images
  – promoted worldwide as the problem solution
    • discussions, however, are ongoing
Some facts

• Regulations differ widely throughout the world
  – US performed by technicians / sonographers
    • eg., USA, Britain ...
  – US only performed by physicians
    • eg. Austria, Germany ...
  – different specialties allowed to perform US
    • obstetric US only by obstetricians, or (also) radiologist?
Some facts

• Regulations differ widely throughout the world
  – US performed by technicians / sonographers
  – US only performed by physicians
  – different specialties allowed to perform US
  – reimbursement differs
    e.g., in Austria some exams are reimbursed with 30,- €
    • whereas in the USA an exam can cost up to several 100,- $
    • differences between specialties
      e.g. in Austria: radiology 30,- € versus neurologist 100,- €
  – indications & trust in results differ, too
Some facts

• Access to imaging (and US) differs
  – availability of radiology service for US - 24/7/365?
    • particularly for pediatric queries?
  – alternate imaging tools often available 24/7/365
    • in “developed” / high resource countries
      BUT: does society still accept the cost for this service?
      – is this a “sustainable business” model?
      – may medicine increasingly become a profitable business?
      or is it a basic human right that must follow different objectives?
  – no /poor availability/access in low resource settings
    • differences between countries, towns versus rural areas ...
Different approaches to healthcare

Task of imaging & US as part of medicine is in part

- USA: to make money
- Europe: to save money
- Low resource settings: have no money
  - don’t know about rest of Asia & central/south America
    - very inhomogeneous field
= will not address
  - will not address disaster situations too – that’s for MSF etc.
    - many more & other aspects to consider
    - many aspects have been & are being discussed widely
Different consequences

• **USA:** can PR / US be provided to everybody 24/7
  – even for the poor?
    • also in rural areas?
    • who provides children with US at primary care?
      – quality & coverage ...
  – how to earn money needed?
    • concentration in large children's' hospitals
    • buying into several places...
      – provide remote service
Different consequences

- **USA**: can PR be provided to everybody 24/7
- **Europe**: PR is threatened & endangered
  - children have no lobby
  - are costly, don’t vote ...
  - PR being reduced or shut down
    - subspecialty withdrawn
      - e.g. Sweden
    - PR partially not existing at all
    - who performs pediatric US
      - pediatricians, surgeons, general radiologists ...
Different consequences

- **USA:** can PR be provided to everybody 24/7
- **Europe:** PR is threatened & endangered
  - children have no lobby
  - are costly, don’t vote ...
  - PR being reduced or shut down
    - subspecialty withdrawn / not existing
      - eg. GE: 10 professorships gone
      - 110 PR for 11 million children
- **Eastern Europe** – no PR ...
- better in CH: children hospitals must have PR
Different consequences

• USA: can PR be provided to everybody 24/7 –
• Europe: PR is threatened & endangered
• Low resource settings (Africa, parts of Asia ...)
  – not only no money
    • no infrastructure
    • no equipment
    • no personnel
      – also radiologists rare
        » particularly in rural areas
      – if, then clinicians perform US
Different consequences

- USA: can PR be provided to everybody 24/7 –
- Europe: PR is threatened & endangered
- Low resource settings (Africa, parts of Asia ...)
  - not only no money
  - outreach & training programs exist
    - who benefits?
    - who pays?
    - just charity or other interests?
    - will educated staff stay?
    - is (donated) equipment available & durable & appropriate?
Different consequences

- USA: can PR be provided to everybody 24/7 –
- Europe: PR is threatened & endangered
- Low resource settings
- **For all regions**: new approaches necessary
  - role for WFPI to coordinate & link activities
    - not only „third“ world
  - Tele-reading? POC-US?
    - who? resources?
    - treatment possible? consequences?
Other aspects to considered

• Global = "third world“ + Europe + Americas ...
  – partially vast differences between the continents
    • for Pediatric Radiology in general
    • also concerning US

• Variations within 1 continent
  – even within 1 country
    • between institutions etc...
  – even within same institution
Other aspects to considered

• Global = "third world“ + Europe + Americas ...
• Variations within continents, countries ...
• Differences between various specialties
  – partially tend to only address only their specific needs
    • particularly clinical specialties
      – pulmonologist, enterologist, neonatologist, urologist, ER-physician ...
  – often no overall knowledge available
    • but high level special knowledge & skills in small area
      – however: may create also risks for patient ...

these development have limitations, dangers & risks
Some more considerations

• Need for US & imaging demands differ
  – emergency versus standard care versus POC
    • do we miss essential aspects with POC-US?
    • does this endanger patients?
      – does this secondarily even increase health care costs?
      – does (and where does) it improve care
        » only in areas with no other options?
Some more considerations

• Need for US & imaging demands differ
  – emergency versus standard care versus point of care
  – is US as the imaging method & result legally robust?
  • can therapy & managements decision be based on US?
  • does US allow to safely replace CTs?
    – if so, which kind / level of US?
    – is PO-CUS sufficient for this scenario, too?
Some more considerations

• Need for US & imaging demands differ
  – emergency versus standard care versus point of care
  – is the imaging method & result legally robust?
  – which level of imaging in which clinical situation?
    • eg. mild versus multiple & severe trauma
    • imaging for mild vomiting ...
    = which level & kind of US is adequate for which query ...
      – and in which setting?
Some other thoughts

• Quality of imaging (and US, too) differs
  – who is performing it
  – time for preparation
  – device adequate?
    • system, transducers …
  – all (modern) methods available & applicable?
    • equipment software & options
    • contrast media …
    • necessary to have these options available?
Desirable equipment characteristics

• Needs to be defined with respect to future use
  – different for „first“ or „third“ world
  – different for different institutions & locations
  – individual variation must be possible
    • without endangering overall quality requirements
    • may otherwise give space for misuse
      eg. for economic reasons
      – often then Pediatric Radiology comes last (e.g. in Europe)
Desirable equipment characteristics

• Needs for devices used in low-resource settings
  – appropriate to purpose & environment
    • safe, affordable, high quality, potentially mobile, easy to use
      – software included, no additional fees for software license renewal
  – durable even in inclement conditions
    e.g. wild oscillations of voltage/current
      – know the local electrical grid
    • rechargeable battery (also for power outages)
    • durable in non-air conditioned, dusty or moist environments
    • ............
Desirable equipment characteristics

- Additional aspects for use in low-resource settings
  - appropriate to purpose & environment
  - durable even in inclement conditions
  - maintenance / service must be granted
  - no "surprises"
    - e.g., no additional components to be purchased separately
      - all transducer for that particular practice's clinical indications & local burden of disease etc ... (also true elsewhere)
- PACS and/or tele-radiology /DICOM compatibility
  - low-speed or high-speed connections ..., wireless ...
Where do we go?

• Who should do pediatric US?
  
  The “dogma” - for the sake of the children
  – proper quality has to be provided
  – US service has to accessible
  – no turf battles are desirable
Where do we go?

- Role of Pediatric Radiology (& pediatric US)
  - might / should (?) we take the lead
    - as the subspecialist experts
    - to define the standards
      - for the different levels of US
    - to create quality assurance measures
    - to provide / supervise education & training

BUT: first of all we need to acknowledge

must keep US in the Pediatric Radiology armamentarium
  - as an indispensable & requisite imaging tool
  - work for it, develop US, make US accepted ...
BUT: can we go just go on?

- Pediatric Radiology is not existing everywhere
  - to perform the necessary US examinations
  - to teach & safeguard & further develop pediatric US?
    - who else will do & take on this important job?
- Pediatric Radiology endangered in other areas too
  eg., some European countries
    - this also need attentions
  - who will educate & support future colleagues?
    - who will be available for outreach ... 
    - where can people learn, where do research?
Where do we want to go?

- Pediatric Radiology should avoid fighting windmills
  - long lost battles
  - not aimed at patient benefit
  - not waste resources
  - avoid creating frictions
Where might pediatric US go?

• Tasks & to do
  – strengthen Pediatr Radiol & pediatric US
    • particularly in USA & Europe
      – to grant quality & consistency of all US applications
      – otherwise research & education might be endangered
  – develop pediatric US services for other areas
    • Asia, Eastern Europe, South America, some parts of Asia ...
      – regions with some but insufficient structures
  – introduce pediatric US, maybe as POC service
    • “low resource settings”
      – different needs & requirements – to start, “bridging” option
Where **might** pediatric US go?

- Perspectives & hopes
  - increasing need for reliable US
    - throughout body, all over the world
      - no radiation
      - devices relatively inexpensive
  - proven benefits of US might strengthen importance
    - exhaustive service might be made available
      - education & staff & equipment
      - standards will become necessary
      - quality assurance will become accepted
Where might pediatric US go?

• Risks, threats & limitations
  – economic pressure
    • will even increase all over the world
      – less expensive POC-US established as universal approach
      – **BUT**: will we miss things? does this impair patient care?
  – decreasing number of Pediatric Radiologists
    • already a fact in some European countries
      – no career perspective, low income ...
  – what about demographic developments?
    • more children in areas with no/little PR/pediatric US
      – research & education might be endangered
Where **should** pediatric US go

- **Strategies**
  - join forces: *together we are strong*
    - within Pediatric Radiology
    - with other specialties
    - with colleagues all over the world
  - set standards: *prove we know what we do*
    - define, develop and maintain level & quality
  - be active & visible: *promote proper pediatric US*
    - in research & education
    - belief in & perform it ourselves, offer the necessary service
Conclusions & Take away

• Not always the same applies to everything – or fits everywhere & everybody’s needs
  • individualized approach
  • solution have to fit environment and options ...
Conclusions & Take away

• Not all that can be done, should be done
  – and is really useful & worth while
  • think about efficacy & impact
Conclusions & Take away

- Therefore
  - let’s try to find solutions that last
    - are economically feasible in the respective environment
    - enable further development
    - in cooperation with our clinical partners
    - for the benefit of the patients world wide
Summary

• Pediatr Radiol must keep US in its armamentarium
  – indispensable & requisite imaging tool

• Pediatric Radiology should take on responsibility
  for the sake of our patients, ie. the children:
  – take the lead as the subspecialist experts
  – define standards & provide proper quality
  – create quality assurance measures
  – provide / supervise education & training
Summary

- Remember: we still & also are physicians
  - prime task = the individual patient care
- We have to get together
  - talk with & learn from our (clinical) partners
    - try a team approach – together one is stronger
Summary

• Remember: we still & also are physicians
  – prime task = the individual patient care

• We have to get together
  – talk with & learn from our (clinical) partners
    • try a team approach – together one is stronger

• We have to make “proper” US available
  – to all small patients around the world
    • in spite of new challenges & various obstacles
    • even more important in light of Image Gently Campaign
Summary

• We need to promote thorough research
  – comparative, efficacy oriented (evidence?)
    • evidence is not the holy grail, particularly in children
  – necessary to prevent promoting a wrong solution
    eg., for low resource settings that may even be dangerous
    • may constitute an alibi tool
      – prohibiting establishment of proper health care structures
      – endanger existing more expensive environments
Summary

• We need to promote thorough research
  – comparative, efficacy oriented (evidence?)
  – necessary to prevent promoting a wrong solution

• POC-US may serve as a good bridging option
  – until better & proper structures are in place

• An orienting “sonoscope” may be helpful tool
  – in certain clinical conditions & scenarios
  – where such basic information is necessary & sufficient
    • for immediate triage & decision making
    • if no other imaging options available
Summary

• We need to acknowledge widely varying use of US
  – by different medical (and even non-medical) groups
    • will continue, also has its benefits
• Even & particularly in this scenario, (Pediatric) Radiology has an important future role
  – safeguard proper education
  – define standards for all pediatric US applications
  – initiate & encourage quality assurance measures
  – promote & perform research
    • enable future development
Any questions or comments?

Yes, please, ...
You are seeking for:
- an update into on Paediatric Radiology
- insights into Paediatric Radiology research
- meeting experts in Paediatric Radiology

ESPR 2015
52ND ANNUAL MEETING &
38TH POST GRADUATE COURSE OF
THE EUROPEAN SOCIETY
OF PAEDIATRIC RADIOLOGY

June 2-6, 2015
Congress Graz | Graz / Austria
Prof. Michael Riccabona

www.espr2015.org
office@espr2015.org