MARKLÝSING FYRIR SÉRNÁM Í LÆKNISFRÆÐILEGRI MYNDGREININGU Á LANDSPÍTALA HÁSKÓLASJÚKRAHÚSI

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EFNISYFIRLIT

Myndgreining höfuðs og háls (B-I-7)

Inngripsmyndgreining (B-I-8)

Myndgreining stoðkerfis (B-I-9)

Myndgreining taugakerfis (B-I-10)

Myndgreining barna (B-I-11)

Myndgreining þvag- og kynfæra (B-I-12)

Ísótópamyndgreining (B-I-13)

Geislaeðlisfræði og geislavarnir (B-I-14)

Myndgreiningaraðferðir, skuggaefni og

Sameindamyndgreining (B-I-15)

Upplýsingatækni tengd myndgreiningu (B-I-16)

Samskipti og stjórnun (B-I-17)

Rannsóknir og gagnreynd læknisfræði (B-I-18)

FRAMVINDUSKRÁNING

HANDLEIÐSLA OG NÁMSMAT

ÓFULLNÆGJANDI NÁMSFRAMVINDA

SAMVINNA VIÐ SÉRFRÆÐALÆKNA DEILDARINNAR

SÉRFRÆÐIPRÓF

VIÐHENGI 1 - NÁNARI UPPLÝSINGGAR M.T.T. FRAMVINDUSKRÁNINGAR, HANDLEIÐSLA OG NÁMSMAT (Á ENSKU)

VIÐHENGI 2 – HÆFNI Í STARFI (Á ENSKU)

VIÐHENGI 3 – EYÐUBLAÐ FYRIR NÁMSMAT SÉRNÁMSLÆKNA

INNGANGUR

Læknisfræðileg myndgreining er mikilvæg sérgrein innan læknisfræðinnar. Greinin er í daglegu tali nefnd röntgenlækningar og þeir sem hana stunda röntgenlæknar. Þetta á sér sögulega skýringu en Þjóðverjinn Wilhelm C. Röntgen (1845-1923) var undir lok 19. aldar fyrstur til að uppgötva og lýsa eðli og hagnýtingu geislans sem við hann er kenndur.

Greinin á sér langa og merkilega sögu á Íslandi. Upphaf fagsins er oft miðað við árið 1914 þegar Dr. Gunnlaugur Claessen (1881-1948) setti á fót Röntgenstofnun Háskóla Íslands. Fyrsta röntgendeild LSH (þá Landspítalans) var stofnuð 1930 og Félag röntgenlækna hefur verið til á Íslandi frá árinu 1957.

Íslenskir röntgenlæknar hafa hingað til fengið sérfræðiréttindi í greininni erlendis enda hefur formlegt nám til sérfræðiréttinda í faginu hér á landi ekki staðið læknum til boða. Árum saman hafa deildarlæknar (þ.e. almennir læknar án sérfræðiréttinda) starfað við deildina í skemmri tíma (1-2 ár) og oftast fengið sinn starfstíma metinn upp í formlegt sérnám erlendis. Ástæða þess er fyrst og fremst sú að annars vegar er efniviður frá sjúklingum á Íslandi takmarkaður vegna fámennis og hins vegar er röntgendeild LSH ekki skipt upp eftir undirsérgreinum.

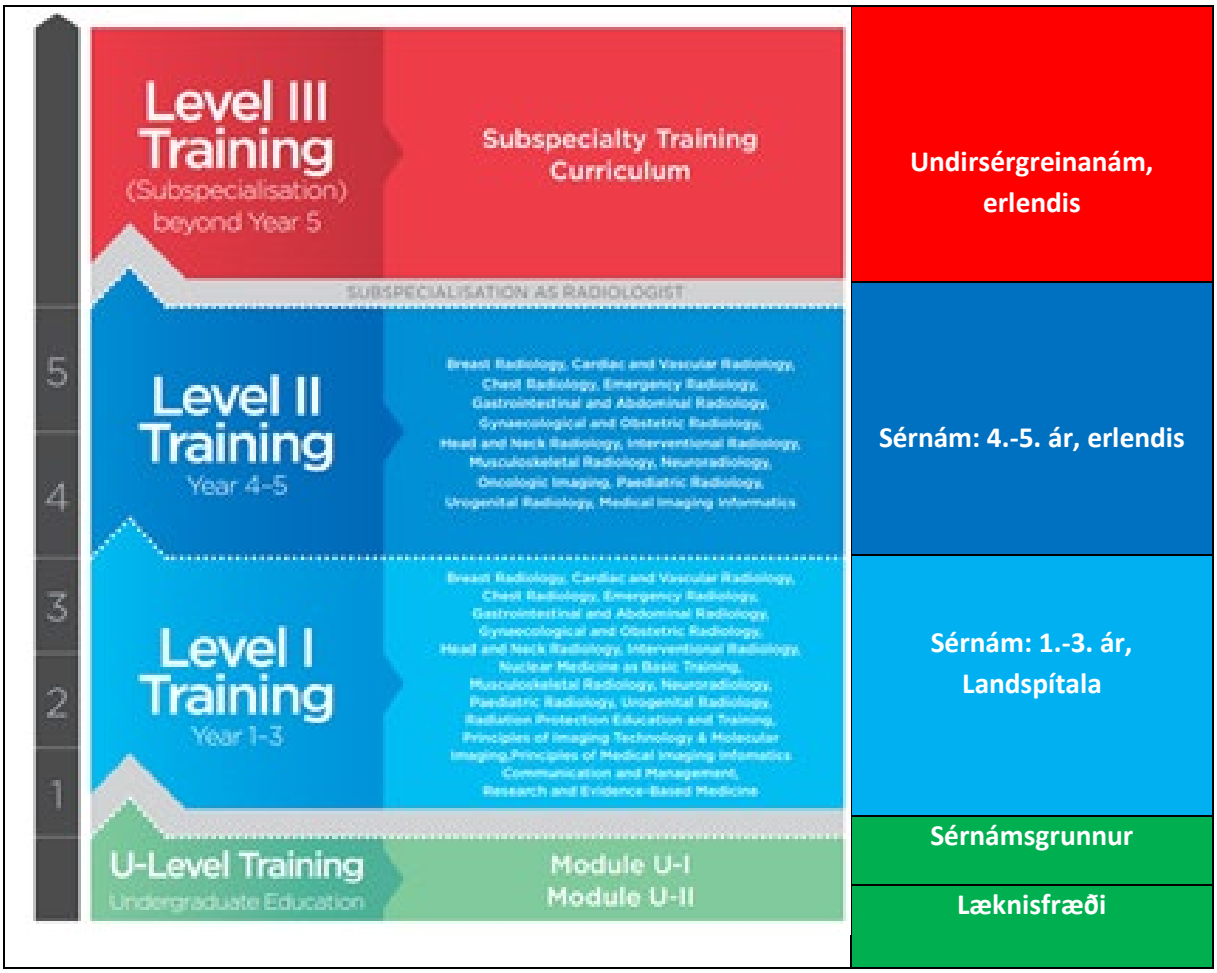
Á undanförnum árum hefur krafan um viðurkennt sérnám í læknisfræðilegri myndgreininguá Íslandi aukist. Landspítali Háskólasjúkrahús (LSH) býður nú upp á sérnám í hinum ýmsu sérgreinum læknisfræðinnar, að hluta til eða heild. Þessi marklýsing endurspegla þá þróun og vilja röntgendeildarinnar til að vera þáttakandi í þeirri henni.

Marklýsing þessi fjallar um sérnám í læknisfræðilegri myndgreiningu (röntgenlækningum) á LSH og er gerð á grundvelli reglugerðar 467/2015 um skilyrði til að hljóta sérfræðileyfi (sjá: https://www.reglugerd.is/reglugerdir/allar/nr/467-2015). Tilgangurinn er að uppfylla ákvæði 15. greinar reglugerðarinnar um marklýsingu þar sem kveða skal á um skipulag og inntöku í sérnám, innihald, fyrirkomulag og lengd sérnámsins og einstakra námshluta, gæðakröfur handleiðslu og hæfnismat. Marklýsingin gerir ráð fyrir að skipulegt sérnám í myndgreiningu hér á landi geti verið að hámarki 3 ár en að sérnámslæknir ljúki náminu erlendis til að afla sér frekari reynslu og sérþekkingar sem uppfylli ýtrustu skilyrði námsins. Í reglugerðinni segir að skipulagi sérnáms skuli þannig háttað að alþjóðlegum gæðaviðmiðunum sé mætt. Samkvæmt viðbót við reglugerðina (nr.411/2021) er aðeins „heimilt að veita sérfræðileyfi hér á landi í þeim sérgreinum þar sem marklýsing fyrir sérnámið í heild hefur verið samþykkt af mats- og hæfisnefnd, sbr. 15. gr.“ og því tekur marklýsingin sjálf til fulls fimm ára sérnáms, þó einungis fyrsti hluti þess fari fram á Íslandi.

Í gegnum tíðina heftur mikill meirihluti íslenskra röntgenlækna stundað sitt sérnám á Norðurlöndum og þar af flestir í Svíþjóð. Ekki er að sjá að breyting verði þar á í nánustu framtíð. Því er mikilvægt að uppbygging sérnáms hér heima styðjist við þær marklýsingar og kennsluskrár sem líklegast er að eigi við í þeim löndum þangað sem verðandi röntgenlæknar leita á síðari stigum sérnámsins. Af þeirri ástæðu hefur þótt liggja beinast við að miða við fyrirmæli og almenn ráð sænskra heilbrigðisyfirvalda (socialstyrelsen) um sérnám og marklýsingu; Föreskrifter och allmänna råd, Läkarnas specialiseringstjänstgöring, Målbeskrivingar 2015 (viðauki 2) og Kompetenskrav inom radiologi (viðauki 3) (sjá nánar: https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/%20artikelkatalog/ovrigt/2015-4-5.pdf). Uppbygging marklýsingar í sérnámi í

læknisfræði í Svíþjóð og áfangar og markmið eru sett fram á svipaðan hátt fyrir allar sérgreinar.

Fyrir liggur að talsverðar breytingar munu eiga sér stað innan skamms á sænsku marklýsingunni og í raun heildaruppbyggingu sérnámsins í Svíþjóð. Þar í landi er þróunin í þá átt að því að aðlaga og samhæfa sérnámskröfur, markmið og uppbyggingu sérnáms sem mest að marklýsingu Evrópusamtaka röntgenlækna (ESR: European Society of Radiology) (https://www.myesr.org/sites/default/files/2019-11/ESR%20Training%20 Curriculum %20I%E2%80%93II.pdf). Íslensku röntgenlæknasamtökin eru aðili að ESR og af þessum ástæðum er heppilegast að framkvæmd sérnámsins á Íslandi styðjist sem mest við þessa samevrópsku marklýsingu. Megindrættir sérnámsuppbyggingar ESR er hér sýnd á skýringarmynd:



Önnur og ríkari ástæða til vals á ESR umfram marklýsingar einstakra landa (eða jafnvel landshluta eins og hefur tíðkast í Svíþjóð) er sú að framkvæmd evrópska sérnámsins er þrepaskipt. Það býður upp á að Íslenskir röntgenlæknar geti lokið fyrra stiginu hér heima (allt að 3 ár) en lokið sérnáminu (a.m.k. 2 ár) á evrópskri grund. Gert er ráð fyrir að heildar sérnámstími sé óbreyttur að lágmarki 5 ár eins og evrópskar og íslenskar reglugerðir segja fyrir um. Einnig ber að líta til þess að margir sérnámslæknar hafa valið að halda fyrr utan (eftir 1-2 ár) og hafa alla jafna fengið tíma sinn á Íslandi metinn upp í sérnámstímann þar.

Það er ekkert í vegi fyrir því að þeir sem svo kjósa haldi utan áður en að fyrra þrepinu er náð innan skipulagðs sérnáms í greininni á Íslandi. Slíkt verður einfaldara í framkvæmd sé alþjóðlegri marklýsingu frá ESR fylgt á Íslandi með viðurkenndu og vottuðu sérnámi. Einnig má ætla að þeir sem kjósa að ljúka sínu námi í löndum utan Evrópusambandsins , s.s. Bretlandi eða Norður-Ameríku, ættu auðveldara með að fá tíma í sérnámi hér metinn á grundvelli þess hversu ítarleg, stöðluð og alþjóðlega viðurkennd evrópska marklýsingin er og hvernig framkvæmd hennar er háttað á Íslandi.

Marklýsing hefur verið kynnt innan Félags röntgenlækna. Hún krefst samþykkis ráðherraskipaðrar Mats- og hæfisnefndar sem og úttektar nefndarinnar á röntgendeild LSH til viðurkenningar um hæfi til að bjóða upp á sérnám eins og getið er um í 15. gr. reglugerðar 467/2015 (sjá: https://www.reglugerd.is/reglugerdir/allar /nr/467-2015). Tryggja þarf nægilegan fjölda sérnámshandleiðara með viðeigandi bakgrunn og verður miðað við að heildarfjöldi sérnámslækna sé 1-2 fyrir hvern sérnámshandleiðara. Miðað er a.ö.l. við Almenn viðmið og leiðbeiningar um sérnám á Íslandi („Gullbókina“) frá Embætti landlæknis (útgefið 2021).

MYNDGREINING

Læknisfræðileg myndgreining (röntgenlækningar) er viðurkennd aðalsérgrein samkvæmt reglugerð 467/2015 og undir hana teljast nokkrar undirsérgreinar, þ.e.a.s. myndgreining barna, ísótópamyndgreining, inngripsmyndgreining, myndgreining stoðkerfis og myndgreining taugakerfis. Sérfræðilæknir í myndgreiningu getur auk þess haft sérþekkingu á ákveðnu undirsviði sem ekki er sérstaklega viðurkennt af embætti Landlæknis.

Sérgreinin fjallar um greiningu, mat og meðferð á sjúkdómum með formfræðilegum (e. morphological) og starfrænum (e. functional/physiological) aðferðum til könnunar á uppbyggingu, starfsemi og sjúklegu ástandi mannslíkamans eins og hún birtist í myndrannsóknum. Þekkingarsvið sérgreinarinnar felur í sér skilning og kunnáttu á notkun, notagildi og takmarkana mismunandi myndgreiningaraðferða innan líffærakerfa og sjúkdómaflokka.

Störf innan greinarinnar byggja einnig á samstarfi við lækna innan ólíkra sérgreina þannig að hún nýtist sem best við greiningu og meðferð sjúklinga.

Sérgreinin byggir á vísindalegum rannsóknum og gagnreyndri læknisfræði, sem nýtast til sjúkdómsgreiningar og meðferðar en jafnframt þróunar á aðferðafræði, gæðastarfi og kennslu innan greinarinnar.

SÉRNÁM Í MYNDGREININGU

INNTÖKUSKILYRÐI

Sérnámsstöður í myndgreiningu skulu auglýstar samkvæmt samræmdu ráðningarferli fyrir sérnámsstöður lækna á Landspítala og Sjúkrahúsinu á Akureyri. Til að geta hlotið ráðningu í sérnámsstöðu í myndgreiningu þarf að uppfylla eftirfarandi skilyrði:

1. Að læknir hafi lokið prófi frá Læknadeild Háskóla Íslands eða sambærilegum erlendum háskóla skv. 3. gr. reglugerðar 467/2015
2. Að læknir hafi almennt lækningaleyfi á Íslandi.

Sérnámsgrunnur samkvæmt reglugerðar 411/2021 er nauðsynlegur til þess að hefja og taka þátt í sérnámi í myndgreiningu.

Allir umsækjendur sem uppfylla skilyrði um ráðningu skulu boðaðir í viðtal með yfirlækni og kennslustjóra. Þeir skulu vera ótengdir umsækjanda. Mat á hæfi læknis skal vera hlutlægt og byggja á eftirfarandi þáttum hið minnsta:

1. Ferilskrá og mati á henni.
2. Einkunnum á embættisprófi og stöðluðum prófum í læknisfræði.
3. Fyrri störfum að rannsóknum, kennslu og öðrum verkefnum sem þýðingu hafa og fram koma í ferilskrá.
4. Umsögnum og meðmælum fyrri leiðbeinenda eða vinnuveitenda.
5. Frammistöðu í viðtali þar sem m.a. er tekið tillit til viðhorfs áhuga og þekkingar umsækjenda á faginu, svo og sýn hans á stöðu sinni innan læknisfræðinnar og myndgreiningar í nútíð og framtíð.

STARFSHLUTFALL Í SÉRNÁMI

Gert er ráð fyrir að sérnámslæknir sé í fullu starfi (100% starfshlutfall) við röntgendeild LSH og taki þátt í vaktavinnu jafnt við aðra námslækna. Sumarfrí og lögboðin frí tengd vaktavinnu reiknast inn í námstímann en fjarvistir umfram tvær vikur fram yfir þann tíma geta leitt til lengingar á námstímanum. Mögulegt er að óska eftir hlutastarfi vegna sérstakra aðstæðna og er hvert tilfelli skoðað sérstaklega. Ef til lengingar sérnáms kemur vegna framvindumats, fæðingarorlofs, veikinda, námshlés eða sambærilegra atvika sem talin eru í skjali embættis landlæknis „Almenn viðmið og leiðbeiningar vegna sérnáms á Íslandi“ (svokölluð Gullbók), þá skal ráðningarsamningur framlengdur eins og þarf..

NÁMSTÍMI

Nám til sérfræðiréttinda tekur að minnsta kosti 5 ár (60 mánuði). Sérnám í myndgreiningu á LSH hefur að markmiði að veita allt að 3ja ára grunnþjálfun (1. þrep ESR) í almennri læknisfræðilegri myndgreiningu og tryggja þannig grunn að áframhaldandi námi og þjálfun til fulls sérnáms (2. þrep ESR) á annarri viðurkenndri stofnun innan Evrópu. Endanleg sérfræðiviðurkenning yrði veitt í viðkomandi landi eða á Íslandi. Hvort námstími á Íslandi er viðurkenndur erlendis er háð reglum og hefðum í hverju landi fyrir sig. Heildartími sérnámsins við röntgendeild Landspítala miðast því við hið mesta 3 ár í fullu starfi í samræmi við fyrri hluta sérnáms (1. þrep ESR) námskrár Evrópusamtaka í myndgreiningu I (Curriculum of the European Society of Radiology), sem miðað er við. Sérnámsgrunnur sem er hluti sérnáms skv. reglugerð er ekki talinn hér með. Gert er ráð fyrir að hluta þessa námstíma sé varið við vísinda- og gæðastörf í greininni. Gæða- og rannsóknavinna er hluti þjálfunar á 3 árum, en kemur ekki nema að litlu leyti í stað sérfræðinámsins sjálfs. Vísindastörf gætu verið viðurkennd sem námstími skv. gildandi reglugerð.

KENNSLUSTJÓRI

Kennslustjóri er sérfræðilæknir á sviði myndgreiningar sem hefur yfirumsjón með og ber ábyrgð á kennslu og námsframvindu sérnámslækna og hefur eftirliti með henni skv. reglugerð og eins og lýst er í Gullbók.

Kennslustjóri samhæfir námsáætlun og tímaáætlun námsins. Hann er skipaður eftir umsóknarferli af framkvæmdastjóra lækninga og heyrir undir hann. Hann er formaður kennsluráðs og situr fyrir hönd sérgreinarinnar í framhaldsmenntunarráði. Kennslustjóri starfar samkvæmt samþykktri starfslýsingu á LSH og ber þar einnig ábyrgð gagnvart yfirlækni sérnáms, og með sambærilegum hætti á öðrum kennslustofnunum. Kennslustjóra ber í samvinnu við sérnámslækni , klíníska handleiðara og sérnámshandleiðarahans að gæta þess að framgangur sérnámsins fylgi námsáætluninni. Kennslustjóri og sérnámshandleiðari taka reglubundið saman gögn á sérnámstímanum og í lok námstímans sem undirbyggja endanlegt framvindumat og hvort kröfur hafi verið uppfylltar.

KENNSLURÁÐ

Í kennsluráði sitja kennslustjóri (formaður) staðgengill kennslustjóra ef við á, yfirlæknir röntgendeildar (eða staðgengill hans, forstöðumaður fræðasviðsins (eða fulltrúi valinn af honum), fulltrúi sérgreinafélagsins og fulltrúi sérnámslækna. Kennsluráð fjallar um skipulag vinnu og kennslu og ráðningar sérnámslækna. Kennsluráð stuðlar að vísinda- og gæðastarfi sérnámslækna og þátttöku þeirra í fræðslustarfi og kennslu á röntgendeildinni (eftir atvikum læknanema, geislafræðinga, lækna í sérnámsgreininni og aðrir sérnámslæknar).

UPPBYGGING SÉRNÁMSINS

Sérnámið er byggt upp af verklegum og fræðilegum námsþáttum, vísinda- og gæðastarfi, auk kennslu.

Mikilvægasti hluti námsins er fólginn í þátttöku í daglegu starfi lækna deildarinnar. Sérnámið fer fram á einingum röntgendeildar Landspítalans í Fossvogi (röntgendeild og inngripsröntgendeild), á Hringbraut (röntgendeild og ísótópa- og JS eining) og Eiríksstöðum (brjóstaeining). Möguleiki er á að sérnámslæknar taki hluta af verknáminu á öðrum innlendum eða erlendum röntgendeildum ef samningur þar um er við röntgendeild LSH og þær hafa fengið viðurkenningu Mats- og hæfisnefndar. Getur slíkt talist sem hluti af sérnámi á Landspítala eftir samkomulagi, efslík dvöl mætir a.ö.l. kröfum sérnámsins. Slíkur hluti á öðrum innlendum eða erlendum röntgendeildum yrði mest sex mánaða tími þar sem sömu marklýsingu og verkferlum er fylgt.

Röntgendeild er skipt í starfsstöðvar í daglegu starfiu á vinnustað og rafrænt og miðast staðsetning sérnámslæknis við að ná bæði samfellu og tímalengd (sbr. að neðan) á viðkomandi starfstöðvum sem styðja þekkingaröflun í faglegum hlutum myndgreiningar með stuðningi klíniskra- og sérnámshandleiðara.

Fyrsta árið er lögð áhersla á almennt röntgen (RTG, a.m.k. 12 vikur), TS rannsóknir, f.o.f. bráðarannsóknir og til uppvinnslu algengra sjúkdóma (a.m.k. 12 vikur), ásamt grunnþekkingu í ómskoðunum sem leiði til færni í algengum ómrannsóknum (a.m.k. 6 vikur). Fyrsta hluta

námstímans eða um 8-12 vikur er áhersla lögð á bráðamyndgreiningu (RTG, TS, ómun) til þess að undirbúa sérnámslækninn fyrir þátttökuí vaktavinnu. Vaktir hefjast um leið og sérnámslæknir hefur næga þekkingu í almennu RTG og TS m.t.t. bráðarannsókna (tékklisti verður fylltur út í framvinduskráningu).

Á seinni 2 árunum bætist við ofangreint dýpri þekking á þessum myndgreiningaraðferðum (RTG [a.m.k. 18 vikur], TS [a.m.k. 24 vikur]og ómun [a.m.k. 14 vikur]), en einnig segulómun (a.m.k. 8 vikur), brjóstamyndgreiningu, jáeindaskanna/ísótóparannsóknum og rannsóknarinngripum (a.m.k. 4 vikur á hverjum stað, lengur á 3. ári ef óskað er).

Svið þekkingaröflunar byggt á undirsérgreinum eða mismunandi faglegum þáttum myndgreiningar fer m.a. eftir staðsetningu á starfsstöðvum röntgendeildar hverju sinni. Aðal áhersla í Fossvogi er á myndgreiningu brjósthols, tauga, höfuð og háls, bein og liði sem og bráðamyndgreiningu, meðan áherslan á Hringbraut er myndgreining barna og myndgreiningu krabbameina, svo og rannsóknir á kviðarholi, þvagfærum og í kvensjúkdómum. Í tengslum við þetta kynnir sérnámslæknir sér starf við fósturgreiningar, hjartaómun og ómun í barnahjartalækningum á Hringbraut.

VERKLEGIR NÁMSÞÆTTIR

Úrlestur rannsókna:

Námslæknirinn les úr myndgreiningarrannsóknum í daglegu starfi í náinni samvinnu við sérfræðilækni sem fer yfir allar bráðabirgðaniðurstöður til endanlegrar staðfestingar. Í þessari samvinnu sérnámslæknis og sérfræðilæknis byggist upp þekking nemandans á réttum klínískum ábendingum myndrannsóknar og klínískri túlkun, greiningarhæfni rannsóknaraðferðanna og takmörkunum m.t.t. sérstakra sjúkdóma og líffærakerfa. Hér þarf sérnámslæknirinn einnig að geta metið gæði rannsókna, þýðingu lakra rannsóknargæða og ná að hafa þekkingu á skuggaefnum og lyfjum sem notuð eru í myndgreiningarrannsóknum, svo og eðlisfræðilegum grunnþáttum rannsóknaraðferða sem beitt er. Sérnámslæknirinn á að læra að þekkja myndrænt útlit meinsemda, rétta túlkun rannsókna, viðeigandi mismunagreiningar og gerð nákvæmra og hnitmiðaðra myndgreiningarsvara. Öll myndgreiningarsvör skulu borin undir sérfræðilækni til endanlegrar staðfestingar. Með þessu er öryggi við greiningu tryggt og eftirlit með störfum sérnámslæknisins verður markvissara.

Framkvæmd rannsókna:

Sérnámslæknirinn lærir undirstöðuatriði varðandi framkvæmd myndgreiningarrannsókna. Hann lærir eðlisfræði aðferða og líffærafræðilega myndgreiningu *(e. radiologic anatomy)*. Þetta tekur m.a. til þekkingar á tækjabúnaði, á innstillingum/tökugildum fyrir rannsóknir, gerð rannsóknarverkferla (e. *protocols*) og framkvæmd ómskoðana og gegnumlýsingarrannsókna.

Myndstýrð inngrip:

Sérnámslæknirinn lærir að meta ábendingar, áhættur og ávinning myndstýrða inngripa, þ.m.t. framkvæmd algengra inngripa, t.d. sýnatökur fyrir vefja- eða vökvasýni og dren-ísetningar undir handleiðslu sérfræðilæknis. Í þessum hluta starfsnámsins skal lögð rík áhersla á upplýsingagjöf til sjúklings og/eða aðstandenda til að skýra út ástæður inngripsins,

ávinning og mögulega áhættu, m.a. til þess að geta fengið upplýst samþykki fyrir slíkri læknismeðferð (sá ítarlegri lýsingu áfanga B-I-8 í námsskrá).

Röntgenfundir:

Daglega eru haldnir röntgenfundir með sérgreinalæknum annara deilda spítalans. Þessir fundir eru iðulega leiddir af sérfræðilækni en sérnámslæknir getur séð um fundi á síðari stigum námstímans, fyrst um sinn undir eftirliti og síðar sjálfstætt skv. hæfnisskema (sjá nánar hér að neðan undir viðhengi 1 og 2). Hann fylgist með og tekur þátt í þverfaglegum samráðsfundum um krabbamein.

Ráðgjöf:

Starf röntgenlæknis er að stórum hluta ráðgjöf til klínískra lækna um viðeigandi rannsóknaraðferðir. Sérnámslæknirinn lærir að svara fyrirspurnum lækna spítalans, og annara notenda þjónustu röntgendeildar, í sínu daglega starfi jafnt sem við aðra verklega þætti þess. Til að veita góða ráðgjöf þarf sérnámslæknirinn að afla sér fræðilegrar þekkingar, starfsreynslu og þekkingar á aðstæðum deildarinnar. Sérnámslæknir er í stöðugu og nánu sambandi við sérfræðilækni í myndgreiningu til þess að ræða þau klínisku úrlausnarefni sem liggja fyrir og hvernig þau verði best leyst með aðkomu myndgreiningar í þeim tilgangi að geta ráðlagt læknum sem vinna við umönnun sjúklingsins. Sérnámslæknirinn er undir stöðugri handleiðslu varðandi þessi samskipti í daglegu starfi og færir sem mest af þessu starfi inn í framvinduskrá um sérnámið, þannig að reynsla hans og þekking sé bæði aðgengileg við framvindumat og rædd við sérnámshandleiðara og þar með einnig vottuð sem næst rauntíma.

Vísinda- og gæðastarf:

Sérnámslæknar þurfa að læra aðferðir gæðavinnu. Gert er ráð fyrir því að sérnámslæknir taki að sér eitt gæðaverkefni undir handleiðslu sérfræðilæknis á meðan á námstíma á Landspítala stendur. Það er ekki krafa að taka að sér rannsóknarverkefni , en diploma-, meistara- eða doktorsnám getur bæst við eftir atvikum. Stefnt skal að því að birta rannsóknarverkefni í innlendum eða erlendum ritrýndum tímaritum. Gæðaverkefni eru kynnt með fyrilestri eða annari sambærilegri kynningu s.s. veggspjaldi, inna deildar, spítala eða á öðrum sviðuðum vettvangi.

Kennsla:Sérnámslæknart geta tekið þátt í formlegri kennslu í myndgreiningu fyrir læknanema og geislafræðinema í H.Í., með fyrirlestrum og seminörum en þeir taka einnig þátt í óformlegri kennslu í formi umræða um túlkun og úrvinnslu þeirra tilfella sem á borð koma hverju sinni á meðan veru studenta á deildinni stendur . Slík kennsluatriði þurfa skráningu og vottun sérnámshandleiðara.

FRÆÐILEGIR NÁMSÞÆTTIR

Kennslufundir:

Hálfan dag í viku (13.00 – 16.00) eru haldnir sérstakir kennslufundir fyrir sérnámslækna. Sérnámslæknar eru skemalagðir á þessa fundi og eru þeir lausir frá hefðbundnum störfum á

þessum tíma. Einn sérfræðilæknir fer með eftirlit þessarar kennslu í hverri viku. Í upphafi kennsluársins í lok ágúst er gerð námsskrá í samvinnu við kennslustjóra þar sem viðfangsefni fræðslufundanna er ákveðið. Fundarefnið getur verið afmarkað viðfangsefni og gjarnan kennslubókakafli og/eða yfirlitsgrein ásamt tengdum kennslutilfellum af deildinni úr daglegu starfi eða tilfelli úr kennsluefni á netinu. Sérfræðilæknar geta einnig kennt með fræðilegum fyrirlestrum. Þá gefst einnig tækifæri til að fara yfir áhugaverð og lærdómsrík tilfelli af deildinni.

Kennslan hverju sinni er leidd af sérnámslækni sem sér um og ber ábyrgð á henni og með honum er röntgenlæknir með viðeigandi undirsérgrein eða áhugasvið. Efni kennslunnar er oftast fræðileg, en geta einnig verið almenns eðlis, t.a.m. umfjöllun um myndgreiningarsvör, tæknileg atriði, fræðigreinar eða vísindastarf.

Fræðslufundir lækna:

Vikulega eru haldnir hádegisfundir með öllum læknum deildarinnar. Tilgangur fundanna er margþættur og er þar m.a. haldin fræðsluerindi, tilfellaumræður og almennar umræður um úrbætur, nýjungar og starfsemi deildarinnar. Þessi fræðsluerindi eru haldin af sérnámslæknum og sérfræðilæknum á víxl samkvæmt áætlun.

Sjálfsnám:

Sérnám í myndgreiningu er rétt eins og í öðrum fögum undir áhuga og vinnusemi nemandans sjálfs komið. Slíkt sjálfsnám felur m.a. í sér lestur kennslubóka, fræðigreina, kennsluefnis á netinu eða netfyrirlestra, og á að grunni til að vera miðað við þau klínisku vandamál sem sérnámslæknir stendur frammi fyrir í daglegu starfi. Umfjöllunarefnið hverju sinni miðast við þann stað sem sérnámslæknir er á í náminu hverju sinni hvort sem um er að ræða umfjöllun um segulómun eða rannsóknarinngrip, sbr. umfjöllun um starfið í uppbyggingu sérnáms. Kennslustjóri, klíníski handleiðarar og sérnámshandleiðarar eru sérnámslæknum innan handar við val á heppilegu námsefni og skal leitast við að kynna sérnámslæknum helstu nýjungar í greininni.

Námskeið og ráðstefnur:

Námslæknar eru hvattir til að sækja ráðstefnur og námskeið hérlendis eða erlendis á meðan á námstíma stendur. Deildarlæknar í árstöðu hafa skv. núgildandi kjarasamningi rétt á 7 dögum fyrir námsferðir auk fluggjalda og ráðstefnugjalda og fá þeir tækifæri til að nýta sér þessi réttindi. Fagráðstefnur og kúrsar innan myndgreiningar eru takmarkaðirhér á landi. Boðið er upp á kennslu í geislaeðlisfræði, tækni og geislavarnir í samvinnu við Geislavarnir Ríkisins og er það vikunámskeið haldið annað hvert ár. Markmiðið er að verði boðið upp á grunnnámskeið (3-5 daga) þar sem fjallað er um undirstöðuatriði innan hverrar undirsérgreinar myndgreiningar. Yrði það ýmist gert með þátttöku í námskeiðum hérlendis, erlendis eða þátttöku í námskeiðum gegnum fjarfundabúnað. . Þátttaka á slíkum grunnnámskeið eru skilyrði fyrir sérfræðiréttindum á Norðurlöndum (sbr. sænsku SK kúrsana) en slíkt er ekki skilyrði í sérnámi á Íslandi.

KENNSLUSKRÁ (MARKLÝING B-I HLUTA ESR)

Námsmarkmið sérnámsins á LSH fela í sér þau atriði sem lýst er í B-I hluta námskrár ESR. Sérnámslæknir skal hafa náð þekkingu og færni í skilgreindum þessum skilgreindu atriðum við lok íslenska hluta sérnámsins (ár 1-3). Dýpri þekking innan hvers áfanga er náð á síðari hluta sérnáms áföngum B-II (ár 4-5) erlendis.

Meginafangar íslenska sérnámshlutans (B-I hluta ESR) eru eftirfarandi:

B-I: LEVEL I TRAINING PROGRAMME (YEARS 1–3)
B-I-1 Breast Radiology
B-I-2 Cardiac and Vascular Radiology
B-I-3 Chest Radiology
B-I-4 Emergency Radiology
B-I-5 Gastrointestinal and Abdominal Radiology
B-I-6 Gynaecological and Obstetric Radiology
B-I-7 Head and Neck Radiology
B-I-8 Interventional Radiology
B-I-9 Musculoskeletal Radiology
B-I-10 Neuroradiology
B-I-11 Paediatric Radiology
B-I-12 Urogenital Radiology
B-I-13 Nuclear Medicine as basic training
B-I-14 Radiation Protection Education and Training
B-I-15 Principles of Imaging Technology & Molecular Imaging
B-I-16 Principles of Medical Imaging Informatics
B-I-17 Communication and Management
B-I-18 Research and Evidence-Based Medicine

Myndgreining brjósta (B-I-1)

Meginmarkmið þessa áfanga er að námslæknir öðlist undirstöðufærni og kunnáttu í greiningu sjúkdóma í brjóstum sem nýst getur til síðari undirsérhæfingar.

KNOWLEDGE
• To understand the anatomy of the female breast, axilla and associated structures and how they change with age
• To describe normal variants and abnormalities of the female breast
• To understand clinical practice relevant to breast imaging
• To describe radiographic techniques employed in diagnostic mammography
• To describe the principles of digital imaging and image processing pertinent to mammography, including standard cranio-caudal and medio-lateral oblique views, additional views, and tomosynthesis
• To understand physics of image production in mammography, particularly how they affect image quality
• To analyse and explain principles of current practice in breast imaging and breast cancer screening
• To know the risk/benefit analysis associated with breast cancer screening
• To describe the proper application of other imaging techniques in this specific field, such as ultrasound, MRI, or radionuclide imaging and to put these into a correct diagnostic pathway
• To describe the indications and contraindications for image-guided interventional breast procedures (fine needle aspiration, core needle biopsy, vacuum-assisted biopsy, presurgical localization)
• To recognise the different presentation of normal breast patterns at mammography, ultrasound, and MRI
• To distinguish the appearance of common benign diseases and of breast cancer on mammography, ultrasound, and MRI
• To understand principles and basic application of a standardized diagnostic categorization systems such as the ACR Breast Imaging Reporting and Data System (BI-RADS®) with reference to mammography, ultrasound, and MRI
• To describe the principles of communication specifically related to the breaking of bad news and consent
• To understand the impact of radiological diagnosis on the treatment (breast conserving/mastectomy)
• To understand the presence of pathological lymph nodes and the significance for further procedures (sentinel/ lymphadenectomy)

SKILLS
• To perform ultrasound examinations of the breast under supervision
• To perform interventional breast procedures under ultrasound and X-ray guidance under supervision
• To perform mammography exams under supervision
• To know how to correctly position the breast in the different projections

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations of the breast
- To choose the best-suited method for evaluating disorders of the breast
- To communicate with the patient in order to obtain informed consent prior to interventional procedures of the breast
- To choose optimal imaging parameters for mammography
- To apply techniques to reduce exposure doses of mammography
- To supervise and teach technical staff to ensure that appropriate images are obtained
- To report mammography, breast ultrasound, and breast MRI with respect to common breast diseases, using descriptors and diagnostic categories according standardised systems such as BI-RADS®
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting breast images
- To communicate with patients and their relatives in order to explain the nature of benign breast disease
- To observe bad news being given to patients and their relatives
- To communicate with patients and their relatives to give bad news
- To participate in and to perform under supervision at multi-disciplinary breast conferences and tumour boards

Myndgreining hjarta og æðakerfis (B-I-2)

KNOWLEDGE

- To describe the normal anatomy of the heart and vessels including the lymphatic system as demonstrated by radiographs, contrast-enhanced CT and MRI
- To describe normal variants of the cardiac, vascular and lymphatic systems
- To understand the mean exposure doses of radiographs and of CT examinations cardiac and vascular systems
- To describe the principles of digital imaging and image processing pertinent to radiology of the cardiac and vascular systems
- To understand the general principles and classification of congenital heart disease and the diagnostic features on conventional radiographs
- To comprehend the natural history and anatomical deformities causing central cyanosis
- To differentiate radiological features and causes of cardiac enlargement, including acquired valvular disease
- To identify the typical features of deep venous thrombosis on Duplex ultrasound
- To identify the typical feature of arterial stenosis and femoral artery pseudoaneurysm on Duplex ultrasound
- To analyse and explain the diagnostic evaluation of ischaemic heart disease, including radionuclide imaging and the basics of coronary angiography
- To differentiate the diagnostic features of vasculitis, atheroma, thrombosis and aneurysmal dilatation of arteries and veins
- To understand the radiological features of pericardial disease

SKILLS

- To perform ultrasound examinations of arteries and veins under supervision
- To plan and to protocol a CT examination of the cardiac and vascular systems and to adapt it to the individual situation under supervision
- To plan and to protocol an MRI examination of the cardiac and vascular systems and to adapt it to the individual situation under supervision
- To perform proper common post-processing tasks for thoracic imaging studies, including multi-planar reformations (MPR), maximum intensity projections (MIP), minimum intensity projections (MinIP), quantitative functional cardiac image analysis and vessel analysis tools
- To perform femoral artery and venous puncture techniques under supervision
- To treat femoral artery pseudoaneurysm under supervision

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations and/or interventional procedures of the cardiac and vascular systems under supervision
- To choose the best-suited method for evaluating disorders of the cardiac and vascular systems under supervision
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging and interventional procedures of the cardiac, vascular and lymphatic systems
- To choose optimal imaging parameters for radiographic, ultrasonographic, CT and MRI examinations of the cardiac and vascular systems under supervision
- To apply techniques to reduce exposure doses for radiographic and CT examinations of the cardiac and vascular systems under supervision
- To supervise and teach technical staff to ensure that appropriate images are obtained
- To report radiographic, ultrasonographic, CT and MRI examinations of the cardiac and vascular systems with respect to common diseases under supervision
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the cardiac and vascular systems
- To identify urgent and/or unexpected findings in imaging examinations of the cardiac and vascular systems and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain their imaging findings of the cardiac and vascular systems
- To participate in and to perform under supervision at multi-disciplinary conferences and tumour boards for diseases of the cardiac and vascular systems

Myndgreining brjósthols (B-I-3)

KNOWLEDGE

- To describe the anatomy of the respiratory system, heart and vessels, the mediastinum and the chest wall on radiographs, CT and MRI
- To describe normal variants of the respiratory system, heart and vessels, the mediastinum and the chest wall
- To understand the mean exposure doses of chest radiographs and of chest CT examinations
- To understand techniques to reduce exposure doses of chest radiographs and of chest CT examinations
- To describe the principles of digital imaging and image processing pertinent to chest radiology
- To understand the significance of generic signs on chest radiographs and CT

GENERIC SIGNS ON CHEST IMAGING

- To confidently identify the following structures on postero-anterior (PA) and lateral chest radiographs:
  - » Right upper, middle and lower lobes; left upper and lower lobes; and lingula
  - » Fissures – major, minor and azygos
  - » Airway – trachea, main bronchi, posterior wall of the intermediate bronchus and lobar bronchi
  - » Heart – position of the atria, ventricles, left atrial appendage and the location of the four cardiac valves
  - » Pulmonary arteries – main, right, left and interlobar
  - » Aorta – ascending, arch and descending aorta
  - » Arteries – brachiocephalic (innominate), carotid and subclavian arteries
  - » Veins – superior and inferior vena cava, azygos, left superior intercostal ("aortic nipple"), and left brachiocephalic (innominate) veins
  - » Components of the thoracic skeleton
  - » Mediastinal stripes and interfaces
  - » Aortopulmonary window
  - » Both hemidiaphragms
- To have an in-depth understanding of the significance of the following chest radiography signs:
  - » Silhouette sign – loss of the contour of the heart or diaphragm indicating an adjacent abnormality (e.g. atelectasis of the right middle lobe obscures the right-hand side of the heart's border)
  - » Air bronchogram – indicates airless alveoli and, therefore, a parenchymal process as distinguished from a pleural or mediastinal process
  - » Air crescent sign – indicates solid material in a lung cavity, often due to a fungus ball, or crescentic cavitation in invasive fungal infection
  - » Cervicothoracic sign – a mediastinal opacity that projects above the clavicles, situated posterior to the plane of the trachea, while an opacity projecting at or below the clavicles is situated anteriorly
  - » Tapered margins – a lesion in the chest wall, mediastinum or pleura may have smooth tapered borders and obtuse angles with the chest wall or mediastinum, while parenchymal lesions usually form acute angles
  - » Gloved finger sign – indicates bronchial impaction, e.g. in allergic bronchopulmonary aspergillosis, or other chronic obstructive processes
  - » Golden sign – indicates lobar collapse with a central mass, often due to an obstructing bronchogenic carcinoma in an adult
  - » Deep sulcus sign on a supine radiograph – indicates pneumothorax
- To describe monitoring and support devices ("tubes and lines") and to confidently identify them on imaging studies

- To describe the imaging features and the preferred placement of the following devices and lines and to list the complications associated with the malpositioning of each of the following:
  - » Endotracheal tube
  - » Central venous catheter
  - » Swan–Ganz catheter
  - » Nasogastric tube
  - » Chest tube/drain
  - » Intra-aortic balloon pump
  - » Pacemaker and pacemaker leads
  - » Implantable cardiac defibrillator
  - » Left ventricular assistant device
  - » Atrial septal defect closure device ("clamshell device")
  - » Pericardial drain
  - » Extracorporeal life support cannulae
  - » Intra-oesophageal manometer, temperature probe or pH probe
  - » Tracheal or bronchial stent
- To describe the typical chest radiography appearances of pleural effusion on erect, supine and lateral decubitus chest radiographs, and to list four causes of a large unilateral pleural effusion
- To describe the imaging features of pleural-based masses with bone destruction or infiltration of the chest wall on a radiograph or chest CT, and to list four likely causes
- To describe the imaging features of a unilateral elevation of one hemidiaphragm on chest radiographs and to list five causes (e.g. subdiaphragmatic abscess, diaphragm rupture and phrenic nerve involvement with lung cancer, post-cardiac surgery, eventration)
- To describe the imaging features and clinical features of tension pneumothorax
- To describe the normal dimensions of the thoracic aorta
- To have an in-depth understanding of the Stanford A and B classification of aortic dissection and the implications of the classification for medical versus surgical management
- To differentiate solitary and multiple pulmonary nodules, benign and malignant neoplasms, hyperlucencies and their potential aetiology and evaluation
- To differentiate thoracic diseases in immunocompromised patients and congenital lung disease
- To analyse and explain disorders of the pulmonary vascular system and great vessels
- To understand the diagnostic role of radiographs, radionuclides, CT and MRI in the diagnostic evaluation of disorders of the pulmonary vascular system and great vessels
- To differentiate abnormalities of the chest wall, mediastinum and pleura

SKILLS

- To plan and to supervise the proper acquisition of radiographs, chest radiographs, ventilation/perfusion imaging, thoracic CT, high-resolution chest CT, and the CT pulmonary angiography (CTPA)
- To perform proper positioning of chest radiographs and of chest CT examinations for adults, newborns, infants and children
- To plan and to protocol a CT examination of the chest and to adapt it to the individual situation
- To plan and to protocol an MRI examination of the chest and to adapt it to the individual situation
- To perform proper common post-processing tasks for thoracic imaging studies, including multi-planar reformations (MPR), maximum intensity projections (MIP), minimum intensity projections (MinIP), and vessel analysis tools
- To perform ultrasonographic examinations in the diagnosis
- To perform aspirations of pleural fluid under image-guidance

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations and/or interventional procedures of the chest
- To choose the best-suited method for evaluating disorders of the chest
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging and interventional procedures of the chest
- To choose optimal imaging parameters for radiographic, ultrasonographic, CT and MRI examinations of the chest
- To design imaging protocols for CT examinations of the thorax, including the appropriate application of intravenous contrast, spatial and temporal resolution, inspiration/expiration and reconstruction/reformatting techniques
- To apply techniques to reduce exposure doses for radiographic and CT examinations of the chest
- To supervise and teach technical staff to ensure that appropriate images are obtained
- To interpret and report radiographs, chest radiographs, ventilation/perfusion imaging, thoracic CT, high-resolution chest CT and CT pulmonary angiography (CTPA) with respect to common diseases
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the chest
- To identify urgent and/or unexpected findings in imaging examinations of the chest and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain their imaging findings of the chest
- To choose optimal biopsy routes and techniques
- To participate in and to perform under supervision at multi-disciplinary conferences and tumour boards for diseases of the chest

Bráðamyndgreining (B-I-4)

KNOWLEDGE

- To describe epidemiological data regarding emergencies
- To understand the common mechanisms of injury including acting forces and their distribution in / over human bodies
- To understand principles and basic application of estimating emergency severity such as the Injury Severity Score (ISS) for trauma cases and pain rating scales with regard to the region of pain in non-traumatic cases
- To describe potentially critical legal aspects
- To describe hygiene regulations
- To describe guidelines and corresponding institutional Standard Operating Procedures/algorithms regarding emergency cases
- To describe relevant normal anatomy of the brain, spine, musculoskeletal system, lung, heart, mediastinum, diaphragm, abdominal organs and spaces, genito-urinary tract, venous and arterial system including topographic relationships and cross-sectional appearance
- To describe common normal variants and distinction from acute pathology
- To describe the various radiological modalities and techniques employed in ER including their respective strengths, weaknesses, opportunities and threats regarding ER
- To describe factors and effects of radiation dose as well as techniques for dose reduction
- To describe criteria for good, reasonable/acceptable, poor and insufficient image quality
- To understand the potential risks and benefits of modality dependent contrast media including effects of oral, rectal bladder or filling
- To describe the various phases of intravenous contrast media application (plain, arterial, portal, delayed, hepatobiliary, urographic) and their respective values according to the clinical problem
- To identify the typical appearance of pericardial effusion, pleural effusion, pneumothorax and free abdominal fluids in extended Focused Assessment with Sonography for Trauma (eFAST)
- To describe respective imaging algorithms for various non traumatic emergency cases
- describe respective imaging algorithms for low-energy and high-energy traumatic emergencies
- To describe the relevant pathophysiology, clinical presentation and modality dependent imaging findings of fractures, hypovolemic shock, pneumothorax, pulmonary oedema, pericardial tamponade, obstructive and paralytic ileus, hollow organ perforation or anastomotic insufficiency, organ laceration or rupture (heart, liver, spleen, kidney, pancreas), ischemia, embolism, thrombosis, arterial dissection or rupture, urinary calculi, acute cholestasis, acute neurological deficits, severe inflammatory conditions (such as meningitis, acute osteomyelitis, abscesses, severe pneumonia, cholecystitis, appendicitis, ...), ovarian and testicular torsion
- As far as not covered by content above: To describe additional knowledge content of other subspeciality curricula in cases where patients may often present initially to those experts such as musculoskeletal, paediatric, neurological, gynecological / obstetrical and male genitourinary emergencies
- To describe the relevant modality dependent imaging findings of tubes, drains and catheters, especially with regards to positions
- To describe radiological standard procedures in polytrauma cases, CT under resuscitation and mass casualty incidents
- To describe theory, indications and contraindications for image-guided interventional procedures in emergency settings

SKILLS

- To assess current guidelines provided by national and international ER and other relevant subspecialty bodies
- To properly perform or supervise patient positioning and protocol choice including the application of techniques to reduce dose exposure
- To perform under supervision or assist in:
  - » e-FAST
  - » sonography and contrast-enhanced ultrasonography of emergency cases
  - » femoral artery and venous puncture techniques
  - » image guided drainage of fluid collections
  - » percutaneous transhepatic drainage of the biliary tract
- other interventional emergency procedures under imaging guidance, particularly in bleeding control
- To identify modality and body region dependent common imaging findings in emergency cases such as fracture patterns, luxations, cartilage injury, ileus signs, free air and fluids, bleedings, infarctions, embolism
- To classify modality dependent imaging findings to be potentially acutely life-threatening, in principal but not immediately life-threatening, severe but not life-threatening or other
- To interpret the relevant modality dependent imaging findings of iatrogenic placement regarding tube, drainage or catheter ocation
- To assist in image interpretation or therapy of >1500 emergency cases (>500 CR, >100 eFAST, >200 US, >500 CT including >25 polytrauma cases and cardiovascular emergency cases, >50 MRI, >10 embolisations, >10 PTD, >30 drainage of fluid collections). These cases have to be distributed proportionally over the body regions and the more common pathologies

COMPETENCES AND ATTITUDES

- To obtain and interpret relevant clinical information
- To differentiate high-risk from low-risk patients before imaging
- To differentiate and prioritise findings with respect to their urgency after imaging
- To be able to 'screen' as fast as possible for life-threatening findings (e.g. for CT: <10 min after scan start) using an optimised infrastructure and selective image reading in case of high-risk patients
- To understand the respective advantages and disadvantages of different imaging options in emergency cases
- To choose the best-suited imaging modality and protocol parameters and, if necessary, to put imaging techniques into the most appropriate diagnostic pathway considering advantages and limitations of the different modalities, diagnostic accuracy and speed, amount of radiation exposure and ethically motivated individual risk/benefit-analysis with respect to case severity, time-to-diagnose/therapy, patient age and sex
- To communicate as fast as possible and effectively with referring physicians and supervisory staff
- To participate at multi-disciplinary treatment, morbidity and mortality conferences
- To participate in Quality Assessment and Quality Monitoring for emergency care
- To participate at multi-disciplinary meetings to discuss challenging emergency cases
- To communicate with patients and their relatives with respect to consent as well as bringing bad news in a multidisciplinary context
- To demonstrate a responsible work ethic
- To appreciate own limitations and to identify when it is appropriate to add further imaging and/or obtain assistance in image interpretation
- To understand principles, physical properties, toxic effects, anaphylactoid reactions and biological effects of imaging contrast media
- To outline the best contrast material and its optimal use according to the imaging technique and the clinical problem
- To describe the various timing phases of contrast media application and their respective values according to the clinical problem
- To describe the fundamentals of intravascular bolus kinetics and constant rate input
- To describe the physiology of renal excretion of contrast medium
- To describe enhancement curves within renal compartments after injection of contrast agents
- To list concentrations and doses of contrast agents used intravenously
- To define the nephrotoxicity of contrast media
- To list risk factors of contrast media nephrotoxicity

Myndgreining meltingarfæra og kviðarhols (B-I-5)

KNOWLEDGE
• To describe the normal anatomy of the abdomen and the main variants of the internal viscera, abdominal organs, omentum, mesentery and peritoneum, abdominal wall and pelvic floor on abdominal radiographs, contrast studies, CT, ultrasound and MRI
• To describe the arterial, venous and lymphatic drainage of the relevant organs in the abdomen
• To understand the principal aspects of embryology of the oesophagus, stomach, duodenum, small bowel, appendix, colon, rectum, anus, pancreas, liver, biliary tract and spleen
• To describe the main anatomical variants that may mimic disease in abdominal imaging
• To describe the clinical presentation and natural history of the most common and/or severe diseases of the abdomen and pelvis and the principles of their treatment
• To know the diagnostic features of common benign abnormalities related to the abdominal solid organs and bowel.
• To understand normal post-procedure imaging related to the commonest surgical and interventional radiology procedures
• To describe the imaging features of abdominal trauma and acute conditions, including perforation, haemorrhage, inflammation, infection, obstruction, ischaemia and infarction affecting the abdominal solid organs and gastrointestinal tract on radiographs, ultrasound and CT
• To describe the imaging features of the most common and/or severe chronic diseases of the abdomen
• To describe the patterns of growth and spread of the commonest tumours of the solid abdominal organs and gastrointestinal tract
• To identify imaging features in regard to the stage and extent of tumours, including features that indicate nonresectability
• To describe the basic principles and standards of post-therapy imaging evaluation (tumour, inflammation)
• To understand the main indications and techniques of interventional radiology as applied to abdominal diseases
• To understand the mean exposure doses of abdominal radiographs and of abdominal CT examinations
• To understand techniques to reduce exposure doses of abdominal radiographs and of abdominal CT examinations
• To understand both the technique and the role of associated examinations like endoscopy, endoscopic ultrasound and nuclear medicine (including SPECT, and hybrid imaging SPECT/CT, PET/CT, PET/MRI)
• To have a basic understanding of radiotracers used in hybrid imaging in gastrointestinal and abdominal diseases
• To understand both the technique and the role of associated examinations like endoscopy, endoscopic ultrasound and nuclear medicine (including SPECT, and hybrid imaging SPECT/CT, PET/CT, PET/MRI)
• To have a basic understanding of radiotracers used in hybrid imaging in gastrointestinal and abdominal diseases
• To understand both the technique and the role of associated examinations like endoscopy, endoscopic ultrasound and nuclear medicine (including SPECT, PET and hybrid imaging)
• To understand the basic principles and the main applications of quantification and functional imaging in abdominal diseases, such as quantification of liver fat, iron or fibrosis, tumour perfusion and bowel inflammation
• To describe the rationale and basic principles of diffusion-weighted imaging in abdominal diseases

SKILLS

- To recognise proper positioning of abdominal radiographs for adults, newborns, infants and children
- To plan a CT examination of the abdomen and to adapt it to the individual clinical condition in regard to intravenous contrast medium, contrast phase and intraluminal contrast medium application, with a dose as low as reasonably achievable
- To perform trans-abdominal ultrasound examinations of the gastrointestinal system, abdominal viscera and their vessels, including Doppler sonography
- To observe contrast-enhanced ultrasound studies of the abdominal viscera
- To observe angiography and vascular and non-vascular-interventional techniques in gastrointestinal disease
- To observe CT colonography examinations
- To perform common post-processing tasks for abdominal imaging studies, including multi-planar reformations (MPR), maximum intensity projections (MIP), minimum intensity projections (MinIP), and vessel analysis tools

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations and/or interventional procedures of the abdomen and/or gastrointestinal system
- To choose the most appropriate modality for evaluating disorders of the abdomen and/or gastrointestinal system
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging and interventional procedures of the abdomen and/or gastrointestinal system
- To choose optimal imaging parameters for radiographic, ultrasonographic CT and MRI of the abdomen and/or gastrointestinal system
- To interpret and report abdominal radiographs, ultrasonographic examinations, abdominal CT studies and MRI examinations of the upper abdomen, small bowel, rectum and anal canal
- To report oncological studies according to international standards (RECIST, WHO) applicable to the specific situation
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the abdomen and gastrointestinal system
- To identify urgent and/or unexpected findings in imaging examinations of the abdomen and gastrointestinal system and to communicate these in a timely fashion and properly
- To communicate with patients and their relatives in order to explain their imaging findings in the abdomen and gastrointestinal system
- To participate in and to perform under supervision at multi-disciplinary conferences and tumour boards for diseases of the abdomen and gastrointestinal system

Myndgreining kvenlíffæra og meðgöngutengdra vandamála (B-I-6)

KNOWLEDGE

- To describe the normal anatomy of the female reproductive organs
- To understand the physiological changes affecting normal imaging anatomy of the female reproductive organs throughout the lifespan
- To understand the physiological changes of the female reproductive organs during pregnancy
- To understand the mean exposure doses of radiographs, hysterosalpingography and CT examinations of the female reproductive organs
- To understand techniques to reduce exposure doses of radiographs and CT examinations of the female reproductive organs
- To describe the clinical presentation and natural history of the most common and/or severe diseases of the female reproductive organs
- To understand normal post-procedure imaging of the female reproductive organs related to previous treatment such as surgery or interventional radiology
- To differentiate imaging features of tumours of the female reproductive organs
- To identify imaging features in regard to the stage and extent of tumours of the female reproductive organs, including features that indicate non-resectability
- To understand the imaging features of common disorders associated with pregnancy and delivery
- To understand the main indications and techniques of interventional radiology as applied to the female reproductive organs

SKILLS

- To perform a transabdominal and, where possible, transvaginal ultrasound in common gynaecological disorders
- To plan a CT examination in patients with common gynaecological disorders and to adapt it to the individual situation with a dose as low as reasonably achievable
- To plan an MRI examination of the female reproductive organs and to adapt it to the individual situation, also in regard to the potential use of intravenous contrast
- To perform imaging examinations for infertility work-up
- To perform proper common post-processing tasks for imaging studies of the female reproductive organs

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations and/or interventional procedures of the female reproductive organs
- To choose the best-suited method for evaluating disorders of the female reproductive organs
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging and interventional procedures female reproductive system
- To choose optimal imaging parameters for radiographic, ultrasonographic, CT and MRI examinations of the female reproductive organs
- To apply techniques to reduce exposure doses for radiographic and CT examinations of the female reproductive organs
- To choose the optimally suited imaging modality for pregnant patients
- To design imaging protocols for CT examinations of the female reproductive organs and for staging in patients with tumours of the female reproductive organs
- To design imaging protocols for MRI examinations of the female reproductive organs including the appropriate application of intravenous contrast and spatial and temporal resolution
- To supervise and teach technical staff to ensure that appropriate images of the female reproductive organs are obtained
- To interpret and report radiographs, CT and MRI examinations of patients with disorders of the female reproductive system
- To report oncological studies in patients with tumours of the female reproductive system according to FIGO stage
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the female reproductive system
- To identify urgent and/or unexpected findings in imaging examinations of the female reproductive system and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain their imaging findings in disorders of the female reproductive system
- To participate in and to perform under supervision at multi-disciplinary conferences and tumour boards for diseases of the female reproductive system

Myndgreining höfuðs og háls (B-I-7)

KNOWLEDGE

- To describe the normal anatomy of the head and neck, including skull base, temporal bone, paranasal sinuses, the oral cavity, pharynx and larynx, the inner ear, salivary glands, thyroid and parathyroid glands, thoracic inlet, orbit, teeth and the temporomandibular joint
- To recall common congenital lesions of the head and neck, including the skull base, temporal bone, paranasal sinuses, the oral cavity, pharynx and larynx, the inner ear, orbit, teeth and the temporomandibular joint
- To understand common manifestations of diseases of the eye and orbit including trauma, foreign bodies, inflammation and tumours
- To understand common imaging manifestations of maxillo-facial trauma and tumours and disorders of the teeth
- To understand common imaging manifestations of lesions and abnormal function of the temporomandibular joint
- To understand common imaging manifestations of disorders of the thyroid, parathyroid and salivary glands
- To be aware of the role of radionuclide imaging in disorders of the thyroid and parathyroid glands
- To be aware of the role of radionuclide imaging in the functional evaluation of endocrine abnormalities
- To understand common imaging manifestations of trauma, inflammation, infection and tumours of the skull base, temporal bone, paranasal sinuses, oral cavity, larynx and pharynx, thyroid and parathyroid, and salivary glands
- To understand the role of ultrasound- and CT-guided puncture of salivary glands, lymph nodes and the thyroid gland

SKILLS

- To perform fluoroscopic examinations of the head and neck region, including barium swallows and sialography
- To observe and perform under supervision ultrasound examinations of the neck, including thyroid, parathyroid lymph nodes and salivary glands
- To plan a CT and a cone beam CT examination in patients with common disorders of the head and neck region and to adapt it to the individual situation with a dose as low as reasonably achievable
- To plan an MRI examination of the head and neck region for the most common indications and to adapt it to the individual situation
- To perform proper common post-processing tasks for imaging studies of the head and neck region including multi-planar reformations (MPR) and maximum intensity projections (MIP)
- To observe image-guided interventional techniques of the head and neck region, e.g. fine needle aspiration biopsy of the thyroid gland

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations and/or interventional procedures of the head and neck
- To choose the best-suited method for evaluating disorders of the head and neck
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging and/or interventional procedures of the head and neck
- To choose optimal imaging parameters for radiographic, ultrasonographic, CT, cone beam CT and MRI examinations of the head and neck
- To apply techniques to reduce exposure doses for radiographic and CT examinations of the head and neck
- To supervise and design imaging protocols for CT and cone beam CT examinations of the head and neck, including staging examinations in tumours of the head and neck region and to adapt the examination depending on the imaging findings
- To supervise pre-defined imaging protocols for MRI examinations of the head and neck and to design MRI protocols for common indications
- To supervise and teach technical staff to ensure that appropriate images of the head and neck region are obtained
- To recognise suboptimal image quality and its causes
- To interpret and report radiographs, ultrasonographic examinations, CT studies, cone beam CT studies and MRI examinations for common diseases of the head and neck region
- To report oncological studies of the head and neck region according to international standards (TNM) applicable to the specific situation
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the head and neck region
- To identify urgent and/or unexpected findings in imaging examinations of the head and neck region and to communicate these timely and properly
- To communicate with patients in order to explain common imaging findings in the head and neck and to observe how to communicate bad news
- To attend as an observer multi-disciplinary conferences and tumour boards for diseases of the head and neck region

Inngripsmyndgreining (B-I-8)

KNOWLEDGE

- To describe the normal anatomy, including common normal variants of the relevant organ, lymphatic, arterial and venous systems and its relevance to interventional radiology
- To describe typical access approaches to common disorders in vascular and non-vascular interventional radiology including biopsy and drainage
- To know the role of different imaging modalities in planning and guiding interventional procedures
- To know how to optimise patient and staff safety during interventional procedures, including understanding of the CIRSE checklist
- To understand the range of treatment strategies for common interventional radiological procedures.
- To describe typical approaches for image-guided ablative techniques
- To understand the risk involved in common interventional techniques and their basic management
- To understand the use, dosage and administration of local anaesthetics
- To understand the pharmacology, administration and patient supervision in relation to intravenous administration of sedation
- To describe the standard procedure in emergency situations, including resuscitation techniques
- To describe typical catheterisation techniques and the principles of selective catheterisation and embolisation
- To understand the indications for nephrostomy drainage, abscess drainage and pleural drainage

SKILLS

- To perform basic arterial and venous catheterisation techniques under supervision
- To perform peripheral arteriography and angioplasty under supervision
- To perform image-guided placement of abscess drainages
- To perform image-guided nephrostomy of dilated renal collecting systems
- To perform image-guided biopsies (at least of superficial structures)
- To perform emergency procedures in life-threatening disorders, including cardio-pulmonary resuscitation

COMPETENCES AND ATTITUDES

- To justify indications for interventional radiological procedures
- To choose the best access routes for an interventional procedure
- To be able to carry out informed consent prior to an interventional procedure
- To use imaging appropriately for interventional procedures
- To optimise techniques to minimise radiation doses for interventional procedures, both for the patient and for the radiologist and staff
- To supervise and teach technical staff to ensure that appropriate support is provided for interventional procedures
- To safely use sedo-analgesia for pain management in patients undergoing interventional radiological procedures
- To ensure adequate monitoring of patients during procedures.
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interventional procedures
- To manage and coordinate emergency situations arising from and/or during interventional procedures
- To communicate with patients and their relatives in order to explain the outcome of the interventional procedure
- To be involved in multi-disciplinary team meetings for patients with potential indications for interventional procedures
- To be able to review and manage patients following interventional radiological procedures
- To be involved with and carry out clinical consultations of patients pre and post procedures.

Myndgreining stoðkerfis (B-I-9)

KNOWLEDGE

- To describe the normal anatomy of the musculoskeletal system
- To be familiar with normal skeletal variants that mimic disease
- To describe common congenital dysplasias of the musculoskeletal system
- To appreciate the value of different imaging techniques in musculoskeletal disorders
- To understand common imaging presentations of trauma involving the skeleton and soft tissue
- To understand the imaging presentation of degenerative disorders of the musculoskeletal system and to appreciate their clinical relevance
- To understand the imaging manifestations of musculoskeletal infection and inflammation
- To understand the imaging manifestations of metabolic diseases, including osteoporosis
- To describe the typical radiographic features of common bone tumours

SKILLS

- To perform ultrasound examinations of the musculoskeletal system for common musculoskeletal disorders
- To plan a CT examination in patients with common disorders of the musculoskeletal system and to adapt it to the individual situation with a dose as low as reasonably achievable
- To plan an MRI examination of the musculoskeletal system and to adapt it to the individual situation
- To perform proper common post-processing tasks for imaging studies of the musculoskeletal system including multi-planar reformations (MPR) and maximum intensity projections (MIP)
- To perform image-guided application of intraarticular contrast media for MR arthrography or CT arthrography under supervision

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations of the musculoskeletal system
- To choose the best-suited method for evaluating disorders of the musculoskeletal system
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging of the musculoskeletal system
- To choose optimal imaging parameters for radiographic, ultrasonographic, CT and MRI examinations of the musculoskeletal system
- To apply techniques to reduce exposure doses for radiographic and CT examinations of the musculoskeletal system
- To design imaging protocols for CT examinations of the musculoskeletal system
- To design imaging protocols for MRI examinations of the musculoskeletal system
- To supervise and teach technical staff to ensure that appropriate images of the musculoskeletal system are obtained
- To interpret and report radiographs, ultrasonographic examinations, CT studies and MRI examinations of the musculoskeletal system
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the musculoskeletal system
- To identify urgent and/or unexpected findings in imaging examinations of the musculoskeletal system and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain the musculoskeletal procedures and imaging findings
- To participate in and to perform under supervision at musculoskeletal multi-disciplinary conferences

Myndgreining taugakerfis (B-I-10)

KNOWLEDGE

- To describe normal anatomy and normal variants of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To describe the normal anatomy of the cranio-cervical and spinal arterial and venous system, and its relevance to diagnostic and interventional neuroradiology
- To describe characteristic endovascular and percutaneous approaches to common disorders in interventional neuroradiology (brain, skull, skull base, extracranial head, and spine/spinal cord)
- To recall common congenital lesions of the brain, skull, skull base, extracranial head, spine and spinal cord
- To understand the rationale for selecting certain imaging techniques, and the use of contrast administration, in diagnosing and monitoring diseases of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To describe the potential risks and benefits of modality dependent contrast media
- To understand the role of advanced CT and MR techniques, including perfusion CT and MR, diffusion tensor imaging, functional MR imaging and proton MR spectroscopy in diagnosing and monitoring diseases of the central and peripheral nervous system, skull, skull base, extracranial head, and spine.
- To understand imaging features of ischaemic and haemorrhagic stroke and other common vascular lesions of the brain and spinal cord and to differentiate these from other disorders
- To understand imaging features of traumatic brain injury and spinal trauma and to comprehend their neurological sequelae
- To understand imaging features and differential diagnoses of metabolic, infectious, inflammatory, toxic, and degenerative diseases involving the nervous system
- To understand imaging features of degenerative disease of the spine
- To understand imaging features of benign and malignant tumours of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To appreciate the role of nuclear medicine, including SPECT and hybrid imaging techniques (PET-CT, PET-MR) in the diagnostic evaluation of disorders involving the brain, skull, skull base, extracranial head, and spine
- To have a basic understanding of radiotracers used in neuro imaging

SKILLS

- To perform ultrasonographic examinations of the carotid arteries, including Doppler-sonographic studies
- To observe ultrasonographic and Doppler-sonographic studies of intracranial vessels
- To perform basic vascular catheterisation and percutaneous techniques under supervision
- To observe diagnostic and interventional supraaortic, intracranial, and spinal digital subtraction angiographies
- To observe image-guided puncture of the spine with and without contrast media application (myelography, diagnostic lumbar puncture)
- To plan CT examinations in patients with common disorders of the brain, skull, skull base, extracranial head, and spine and to adapt them to the individual situation with a dose as low as reasonably achievable, including the decision for or against contrast administration
- To plan MRI examinations in patients with common disorders of the brain, skull, skull base, extracranial head, and spine and to adapt them to the individual situation, including the decision for or against contrast administration
- To perform proper common post-processing tasks for imaging studies of the brain spine/spinal cord, skull base, extracranial head, and peripheral nervous system, including multi-planar reformations (MPR), maximum intensity projections (MIP) and vessel analysis tools

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations and/or interventional procedures of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To choose the best-suited method for evaluating disorders of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging and/or interventional procedures of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To choose optimal imaging parameters for X-ray, ultrasound / Doppler-ultrasound, CT and MRI examinations of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system.
- To apply techniques to reduce radiation dose for X-ray and CT examinations of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To design imaging protocols for CT examinations of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To design imaging protocols for MRI examinations of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To supervise and teach technical staff to ensure that appropriate images of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system are obtained
- To interpret and report X-ray, ultrasound / Doppler-ultrasound, CT and MRI examinations of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To report oncological studies of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system according to international standards (TNM) applicable to the specific situation
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To identify urgent and/or unexpected findings in imaging examinations of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain their imaging findings of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system
- To participate in and to perform under supervision at multi-disciplinary conferences, for diseases of the brain, skull, skull base, extracranial head, spine and spinal cord, and peripheral nervous system

Myndgreining barna (B-I-11)

KNOWLEDGE
• To describe normal paediatric anatomy and normal variants, with particular relevance to normal maturation and growth
• To understand imaging features of common disease entities specific to the paediatric age group
• To be familiar with principles of establishing a child-friendly environment
• To have an in-depth understanding of the relative values of and indications for ultrasound, CT and MRI in children
• To understand the increased vulnerability of children to ionising radiation
• To have an in-depth understanding of the ALARA principle and the special requirements for radiation safety and contrast material dosage in relation to body mass for the paediatric population
• To recall common congenital disorders of the different body regions and their respective relevance for the child´s further development
• To be familiar with the imaging features of common disorders of the brain and spine in neonates, infants and children, including traumatic brain injury (accidental and non-accidental), congenital disorders of the brain and spine, hypoxic injury to the brain, brain haemorrhage and brain tumours
• To be familiar with the imaging features of common disorders of the chest in the paediatric population including bronchiolitis, pneumonia, pleural effusion, pneumothorax, foreign body aspiration, mediastinal masses, thymus and variants, malformations of the airways and oesophageal atresia
• To be familiar with the imaging features of common disorders of the abdomen including intestinal obstruction, necrotising enterocolitis, blunt trauma, pneumoperitoneum and abdominal masses
• To be familiar with the imaging presentation of various grades of vesico-ureteral reflux and urethral anomalies
• To be familiar with the imaging features of gastro-oesophageal reflux, malrotation, Hirschsprung's disease, and anal imperforation
• To be familiar with imaging features of common disorders of the skeletal system in the paediatric population including fractures (accidental and non-accidental), bone dysplasia, tumours, osteomyelitis, joint effusion, Legg–Calvé–Perthes disease and slipped capital femoral epiphysis

SKILLS

- To perform ultrasound examinations of the head in hydrocephalus, subependymal and intraventricular haemorrhage, periventricular leukomalacia and tumours in newborns and infants under supervision
- To perform ultrasound examinations of the chest for evaluating pleural effusion, chest consolidation and normal thymus in newborns, infants and children under supervision
- To perform ultrasound examinations of the abdomen for hypertrophic pyloric stenosis, acute intestinal intussusception, acute appendicitis, intestinal obstruction and volvulus, inguinal hernia, in newborns, infants and children under supervision
- To perform ultrasound examinations of the abdomen for abdominal and pelvic masses, uretero-hydronephrosis, urolithiasis and nephrocalcinosis and cystic disease of the kidney in newborns, infants and children under supervision
- To perform ultrasound examinations of the pelvis for acute pelvic pain in female infants, children and adolescents under supervision
- To perform ultrasound examinations of the scrotum for acute scrotal pain, scrotal masses in male infants, children and adolescents under supervision
- To perform ultrasound examinations of the hip in congenital hip dysplasia and transient synovitis in newborns, infants and children under supervision
- To perform routine fluoroscopic contrast medium studies of the gastrointestinal system and urinary tract including voiding cysturethrography in newborns, infants and children under supervision
- To plan and to supervise the proper acquisition of radiographs, CT, and MRI in newborns, infants and children
- To perform proper positioning of radiographs in newborns, infants and children
- To plan and to protocol CT examinations in newborns, infants and children and to adapt it to the individual situation with special consideration of radiation protection in the paediatric population
- To plan and to protocol MRI examinations in newborns, infants and children and to adapt it to the individual situation
- To perform proper common post-processing tasks for paediatric imaging studies, including multi-planar reformations (MPR)
- To observe interventional techniques in paediatric radiology, e.g. management of intussusception

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations in neonates, infants and children
- To choose the best-suited method for evaluating common disorders in the paediatric population
- To communicate with the parents / caretakers in order to obtain informed consent prior to diagnostic imaging in neonates, infants and children
- To choose optimal imaging parameters for radiographic, ultrasonographic / Doppler-sonographic, CT and MRI examinations of neonates, infants and children
- To apply techniques to reduce exposure doses for radiographic and CT examinations of neonates, infants and children
- To design optimised imaging protocols for CT examinations of neonates, infants and children
- To design optimised imaging protocols for MRI examinations of neonates, infants and children
- To supervise and teach technical staff to ensure that appropriate images of neonates, infants and children are obtained
- To interpret and report radiographs, ultrasound examinations, CT studies and MRI examinations of neonates, infants and children in regard to common disorders in this age group
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of neonates, infants and children
- To identify urgent and/or unexpected findings in imaging examinations of the neonates, infants and children and to communicate these timely and properly
- To communicate with parents / caregivers in order to explain the imaging findings of their children
- To communicate with children and adolescents in an age-appropriate matter in order to explain diagnostic or interventional procedure or imaging findings
- To participate in and to perform under supervision at multi-disciplinary paediatric conferences and paediatric tumour boards

Myndgreining þvag- og kynfæra (B-I-12)

KNOWLEDGE
(SEE ALSO B-I-6 GYNAECOLOGICAL AND OBSTETRIC RADIOLOGY)

- To describe normal anatomy and normal variants of the kidneys, ureters, bladder and urethra
- To describe normal anatomy and normal variants of the retroperitoneum and the male and female pelvis
- To understand the principles of renal function
- To be familiar with typical imaging features of renal parenchymal diseases, including infection and renovascular disease
- To understand contrast medium management in renal failure
- To be familiar with typical imaging features and with the appropriate imaging investigation algorithm of calculus disease
- To understand the imaging features of urinary tract obstruction and reflux
- To understand imaging features and to differentiate tumours of the kidney and urinary tract
- To understand the typical imaging features of renal transplants
- To understand imaging features and differential diagnoses of pathologies of the prostate, seminal vesicles and testes/scrotum
- To be familiar with urogenital emergencies including management

SKILLS

- To perform transabdominal ultrasound examinations of the urinary tract and testes
- To plan CT examinations in patients with common disorders of the urogenital system and to adapt the examination protocol to the individual situation with a dose as low as reasonably achievable, including the decision for or against contrast administration
- To plan MRI examinations in patients with common disorders of the urogenital system and to adapt the examination protocol to the individual situation, including the decision for or against contrast administration
- To perform proper post-processing tasks for imaging studies of the urogenital system, including multi-planar reformations (MPR) and maximum intensity projections (MIP)
- To perform ascending urethrograms and micturating cysto-urethrograms under supervision

COMPETENCES AND ATTITUDES

- To justify diagnostic imaging examinations of the urogenital system
- To choose the best-suited method for evaluating disorders of the urogenital system
- To communicate with the patient in order to obtain informed consent prior to diagnostic imaging of the urogenital system
- To choose optimal imaging parameters for radiographic, ultrasonographic / Doppler-sonographic, CT and MRI examinations of the urogenital system
- To apply techniques to reduce exposure doses for radiographic and CT examinations of the urogenital system
- To design imaging protocols for CT examinations of the urogenital system
- To design imaging protocols for MRI examinations of the urogenital system
- To supervise and teach technical staff to ensure that appropriate images of the urogenital system are obtained
- To interpret and report radiographs, ultrasonographic / Doppler-sonographic examinations, CT studies and MRI examinations of the urogenital system
- To report oncological studies of the urogenital system according to international standards (RECIST, WHO) applicable to the specific situation
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting images of the urogenital system
- To identify urgent and/or unexpected findings in imaging examinations of the urogenital system and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain their imaging findings of the urogenital system
- To participate in and to perform under supervision at multi-disciplinary conferences and tumour boards for diseases of the urogenital system

Ísótópamyndgreining (B-I-13)

KNOWLEDGE

- To describe basic principles of physics including the basic atomic structure, principles of radioactivity and basic of radioactive decay
- To be familiar with basic principles of the production of radionuclides, manufacturing, desirable characteristics and physiological distributions of radiopharmaceuticals and positron emission tomography (PET)-tracers
- To explain the principles of biological and effective half-life
- To understand the principles of quantification of PET studies including standardized uptake values (SUV)
- To describe the basic physical principles of nuclear medicine imaging technology, including gamma cameras, single photon emission computed tomography (SPECT), and PET
- To understand the basic physical principles of hybrid imaging, including SPECT/CT, PET/CT, and PET/MR
- To be familiar with imaging performance parameters, including uniformity of response, system sensitivity, spatial resolution, spatial linearity, count rate performance, and image quality
- To understand safety aspects in nuclear medicine and hybrid imaging, including patient dosimetry, staff dosimetry, contamination, monitoring, choice of equipment, quality control and safety/risk management

SKILLS

- To observe nuclear imaging studies with gamma cameras, SPECT, and PET/CT

COMPETENCES AND ATTITUDES

- To apply the appropriateness criteria and indications for nuclear medicine and hybrid imaging procedures under supervision
- To assist referring physicians in selecting the best-suited nuclear medicine or hybrid imaging examination for common indications
- To communicate with the patient in order to inform them about the procedures and obtain informed consent prior to nuclear medicine or hybrid imaging studies
- To choose optimal imaging protocols for nuclear medicine and hybrid imaging examinations under supervision
- To apply techniques to reduce exposure doses for nuclear medicine and hybrid imaging studies under supervision
- To interpret and report common nuclear medicine and hybrid imaging studies under supervision
- To appreciate own limitations and to identify when it is appropriate to obtain assistance in interpreting and reporting nuclear medicine and hybrid imaging examinations
- To identify urgent and/or unexpected findings in nuclear medicine and hybrid imaging examinations and to communicate these timely and properly
- To communicate with patients and their relatives in order to explain their imaging findings of nuclear medicine studies under supervision
- To participate in multidisciplinary clinical reviews and tumour boards under supervision

Geislaeðlisfræði og geislavarnir (B-I-14)

KNOWLEDGE
• To list the sources and properties of ionising radiation
• To list and explain mechanisms of interaction between ionising radiation and matter/tissues
• To list and explain mechanisms of radioactive decay
• To explain the phenomena of X-ray interaction with matter and the consequences for image generation, image quality and radiation exposure
• To list and explain definitions, quantities and units of kerma, absorbed energy dose (Gy), organ and effective doses (Sv), as well as exposure rate and dose rate
• To understand the mechanism of X-ray production
• To list the components of an X-ray unit and explain the process of X-ray generation
• To explain the function of filters and diaphragms
• To list the common analogue and digital detectors, explain their function and their relative pros and cons
• To explain the role of screens (in analogue radiography) and grids and their effect on image quality and exposure
• To describe radiation effects on cells and DNA
• To describe cellular mechanisms of radiation response, repair and cell survival
• To describe radiation effects upon tissues and organs
• To explain differences in radiation response between healthy tissue and tumours as basis for radiation treatment
• To define and explain stochastic, deterministic and teratogenic radiation effects
• To describe types and magnitudes of radiation risk from radiation exposure in medicine
• To describe the basic principles of radiation protection, as outlined by the ICRP (International Commission on Radiological Protection)
• To specify types and magnitudes of radiation exposure from natural and artificial sources
• To describe concepts of dose determination and dose measurement for patients, occupationally exposed personnel and the public
• To explain the nature of radiation exposure and the relevant dose limits for the worker, including organ doses and dose limits for pregnant workers, comforters, careers, and the general public
• To define As Low As Reasonably Achievable (ALARA) and its applicability to diagnostic radiology settings
• To explain the concepts and tools for dose management in diagnostic radiology with regard to adult and paediatric patients
• To explain the factors influencing image quality and dose in diagnostic radiology
• To describe the methods and tools for dose management in diagnostic radiology: radiography, fluoroscopy, CT, mammography, and those for paediatric patients
• To explain the basic concepts of patient dose measurement and calculation for the different modalities in diagnostic radiology
• To describe the key considerations relevant to radiation protection when designing a diagnostic radiology department
• To list diagnostic procedures performed outside the radiology department with relevant radiation protection considerations
• To list expected doses (reference person) for frequent diagnostic radiology procedures
• To explain quantitative risk and dose assessment for workers and the general public in diagnostic radiology
• To define Quality Assurance (QA) in radiology, QA management and responsibilities, outline a QA and radiation protection programme for diagnostic radiology
• To list the key components of image quality and their relation to patient exposure
• To explain the principle of diagnostic reference levels (DRLs)
• To list national and international bodies involved in RP regulatory processes
• To specify the relevant regulatory framework (ordinances, directives, etc.) governing the medical use of ionising radiation in the respective country and the EU
• To specify the relevant regulatory framework governing the practice of diagnostic radiology in the respective country and in the EU
• To understand the effects of poor-quality images

SKILLS

- To apply radiation physics to optimally select the best imaging modality
- To apply radiation physics to optimise the protocols, using minimal exposure to reach the image quality level needed for the task
- To use the laws of physics to minimise scatter and optimise contrast
- To use the correct terms to characterise exposure in daily radiograph fluoroscope and CT examinations and define organ risk, and estimate the genetic and cancer risk
- To use the technical features of the specific equipment and take advantage of all quality-improving and dose-reducing capabilities while recognising the limits of the machine
- To communicate the radiation risk to the patient at an understandable level, whenever there is a significant deterministic or stochastic risk, or when the patient has a question
- To communicate with the referrer regarding justification, and, if necessary, to suggest a different test
- To apply the three levels of justification in daily practise, with respect to existing guidelines, but also to individual cases (e.g. polymorbidity)
- To optimise imaging protocols by using standard operating procedures (SOPs) and by adapting these to the specific patient's size
- To use specific paediatric protocols, by taking into consideration the physics of small size, but also the elevated risk, vulnerability and specific pathology of each age group
- To choose the best compromise between risk-benefit-ratio, image quality and radiation exposure on a case-by-case basis
- To supervise the use of personal protective equipment
- To support monitoring of the workplace and individuals
- To support exposure assessment, investigation and follow up, health surveillance, and records
- To apply and advise on the use of radiation protection measures in diagnostic radiology (radiography, fluoroscopy-intervention, CT, mammography and paediatric patients)
- To stay within guidance/reference levels in daily practice
- To set up size-specific protocols for high-dose procedures
- To estimate organ doses and effective doses for diagnostic radiology examinations, based on measurable exposure parameters (KAP, DLP)
- To apply standards of acceptable image quality
- To perform retake analyses

COMPETENCES AND ATTITUDES

- To continuously check image quality in order to recognise and correct technical defects
- To demand the best in image quality, technical innovation and exposure reduction for the lowest cost
- To coordinate the commissioning of new equipment with the other members of the core team (radiographer, medical physicist)
- To develop an organisational policy to keep doses to the personnel as low as reasonably achievable (ALARA)
- To avoid unnecessary radiation exposure during pregnancy (warning signs, questionnaire) by optimising the technique (size and positioning of the x-ray field, gonad shielding, tube-to-skin distance, correct beam filtration, minimising and recording the fluoroscopy time, excluding non-essential projections, avoiding repeat radiographs)
- To find and apply the relevant regulations for any clinical situation in radiology
- To choose the best equipment for the patient spectrum based on the resources available
- To take responsibility for choosing the best imaging modalities for the individual patient (radiography, CT, alternatives such as ultrasound or MRI) by taking into consideration the risk of the disease, patient, age and size, the dose level of the procedure, and exposure of different critical organs
- To consult both the patient and staff on pregnancy related concerns in radiation protection
- To take responsibility for patient dose management in different imaging modalities
- To advise patients on the radiation-related risks and benefits of a planned procedure
- To take responsibility for the justification of radiation exposure for every individual patient, with special consideration for pregnant patients
- To take responsibility for choosing and performing the diagnostic procedure with the lowest dose for a given referrer's request
- To take responsibility for optimising the radiographic technique/protocol used for a given diagnostic procedure based on patient-specific information
- To take responsibility for applying the optimal size-adapted and problem-adapted individual protocol for high-dose procedures (CT, fluoroscopy-intervention)
- To supervise quality control procedures on all equipment related to patient exposure
- To take responsibility for the establishment of formal systems of work (Standard Operating Procedures) for radiation protection
- To take responsibility for organisational issues and implementation of responsibilities and local rules in regard to radiation protection
- To take responsibility for compliance with regulatory requirements concerning occupational and public radiation exposures
- To take responsibility for compliance with ALARA principles concerning occupational and public radiation exposures
- To take responsibility for conforming with patient protection regulations (including diagnostic reference levels, where applicable)

Myndgreiningaraðferðir, skuggaefni og sameindamyndgreining (B-I-15)

RADIOGRAPHY

- To explain the relative value of a radiographic examination for the various organ systems and indication
- To have an in-depth understanding of the physical basis of image formation of conventional X-ray
- To explain the concept of electromagnetic waves
- To describe X-ray production, with emphasis on the effects on dose and image quality of altering kV and mA and on the trade-off between diagnostic quality imaging and minimising the effective dose
- To describe the interaction between X-rays and matter
- To describe the structure, role and function of filters, collimators and grids
- To explain the principles of radiographic image acquisition
- To explain the principles of digital image acquisition / digital radiography
- To list and describe the factors affecting image quality in conventional and digital radiography
- To describe the indications for the use of X-ray contrast media in the study of various organs / organ systems
- To describe the principles of fluoroscopy
- To describe the indications for fluoroscopy including the principles of contrast application and to list optimized protocols
- To list techniques to enhance image quality and to reduce radiation in fluoroscopy
- To describe the principles of soft tissue radiography, e.g. in mammography
- To explain the principles of specimen radiography
- To have an in-depth understanding of dosimetry
- To have an in-depth understanding of radiation biology

COMPUTED TOMOGRAPHY - CT

- To explain the relative value of a CT examination for the various organ systems and indications
- To have a good understanding of the physical basis of image formation of computed tomography and of the physics of helical and multidetector CT
- To have a basic understanding of dual-source CT
- To list the major sources of artefacts in CT
- To define the scale of Hounsfield units and to explain the principle of window centre and width
- To list the optimal setting of window centre and width for various organs and tissues
- To list the normal levels of attenuation (in HU) for the various organs and pathological processes in the body
- To describe the principles of optimising sequence protocols for a variety of CT scanner types
- To understand the principles of perfusion imaging with CT
- To understand the principles of CTA protocols, including contrast materials used and reconstruction techniques
- To define CT protocols for the various organs and pathological processes in the body
- To explain the principles of reconstruction algorithms and kernels
- To describe the indications for the use of CT contrast media in the study of various organs / organ systems
- To have a good understanding of CT-dosimetry

MAGNETIC RESONANCE IMAGING - MRI

- To explain the relative value of an MRI examination for the various organ systems and indications
- To explain the fundamentals of MR physics
- To have an appreciation of the hardware associated with an MRI system
- To have a basic understanding of the physical basis of image formation in MRI
- To explain the principles of pulse sequences and relaxation times
- To explain the principles of spin echo and gradient echo sequences and their fast variants,
- To describe the principles and main diagnostic applications for the most commonly used sequences in MRI, including T2-weighted sequences, T1-weighted sequences,inversion recovery sequences, and T2*- / susceptibility weighted sequences
- To describe the typical appearance of tissues, organs and pathological processes on these MR sequences
- To understand the sequence technology for MR angiography (MRA) including time of flight (TOF) , phase contrast (PC), other non-(exogenous) contrast enhanced MRA techniques and contrast-enhanced MRA
- To discuss the advantages and disadvantages of different contrast agents used for MRA
- To discuss the differences between the various MRA techniques
- To discuss advantages and disadvantages of MRA compared with other techniques
- To explain the principles of dynamic contrast-enhanced (DCE) MRI
- To explain the principles of diffusion-weighted imaging (DWI) and diffusion tensor imaging (DTI)
- To have an appreciation of the principles of functional MRI (fMRI) using the BOLD contrast mechanism
- To outline the principles of spectroscopy using 1H
- To describe typical artefacts on MR imaging and to discuss their respective causes and solutions where possible
- To describe the indications/contra-indications for the use of MR contrast agents in the study of various organs / organ systems
- To explain the contraindications to MR imaging and how to conduct MR examinations of patients with MR conditional active or passive implants
- To have detailed appreciation of the safety issues associated with MRI with regard to both patients and staff

ULTRASOUND

- To explain the relative value of an ultrasound examination for the various organ systems and indications
- To describe the nature of ultrasound waves, their propagation, velocity, intensity and the equations that describe them
- To describe the principles of acoustic impedance and to list the tissue properties that determine it
- To describe the frequency of transmission to achieve satisfactory imaging
- To describe the physical principles of the piezoelectric phenomenon
- To list factors that determine the resonance frequency of the piezoelectric element
- To explain the principles of continuous and pulsed emission ultrasound
- To list the factors that focus and unify the ultrasound beam
- To describe the differences between the A, B and TM modes of ultrasound
- To explain the principles of spatial and temporal resolution of ultrasound images as applied to good image formation
- To explain the principles of the Doppler effect and the application of angled beam and direction of flow
- To describe the application of pulsed and continuous wave Doppler and spectral waveform analysis
- To describe the thermal and mechanical biological effects of ultrasound waves, including production of the cavitation phenomenon
- To describe the different types of transducers in ultrasound imaging
- To list the appropriate transducers according to the organs imaged
- To explain the relative value of transcutaneous vs. endoluminal sonography
- To describe criteria for a good ultrasound image
- To describe the major artefacts on ultrasound imaging including reflection, diffusion and speckle and to list their respective causes
- To describe the indications for the use of ultrasound contrast media in the study of various organs / organ systems

CONTRAST MEDIA /AGENTS

- To understand the molecular structure, pharmacology, classification, dose and side effects of all radiographic, MRI and ultrasound contrast media
- To explain the principles of contrast ultrasound media and the relation between the ultrasound beam and microbubbles
- To explain the principle of ionic and non-ionic contrast agents
- To describe the physiological principles, physical properties, toxic effects, anaphylactoid reaction and biological effects of iodinated contrast media
- To describe the physiological principles, physical properties, toxic effects, anaphylactoid reaction and biological effects of MRI contrast agents
- To outline the best contrast material and its optimal use according to the imaging technique and the clinical problem
- To describe the various timing phases of contrast media application and their respective values according to the clinical problem
- To describe the fundamentals of intravascular bolus kinetics and constant rate input
- To describe the physiology of renal excretion of contrast medium
- To describe enhancement curves within renal compartments after injection of contrast agents
- To list concentrations and doses of contrast agents used intravenously
- To define the nephrotoxicity of contrast media
- To list risk factors of contrast media nephrotoxicity
- To identify patients at risk of contrast media nephrotoxicity
- To list methods to reduce the risk of contrast nephrotoxicity
- To describe precautions in diabetics taking metformin and requiring intravascular administration of contrast media
- To list measures to reduce the risk of contrast media nephrotoxicity
- To have an in-depth understanding of nephrogenic systemic fibrosis (NSF) including the definition of NSF, the clinical features and the risk factors
- To describe the use of Gadolinium-based contrast agents in patients at risk

SIGNAL PROCESSING AND POST-PROCESSING

- To have a basic understanding of the principles of signal processing
- To describe the principles of linear systems including convolution, Fourier transformation, Nyquist, image restoration, and deconvolution
- To describe the principles of image display
- To have a good understanding of image quality, including noise, contrast, resolution, and noise amplification during processing
- To be familiar with the principles of quantification including ROI analyses, time–activity curves and factorial analysis
- To understand the principles of image processing including edge, enhancement, smoothing, segmentation, image reconstruction, image fusion, registration, and display

MOLECULAR IMAGING

- To have an understanding of basic principles of cell biology and biochemistry including DNA and RNA activity, metabolism, apoptosis and hypoxia
- To have a basic understanding of stem cell migration and stem cell differentiation
- To understand the basic principles of the most commonly used molecular imaging methods, including nuclear medicine (PET, micro-PET, micro-SPECT) and optical imaging (fluorescence, bioluminescence)
- To have a basic understanding of principles of targeted contrast agents
- To have a basic understanding about demand on pharmacology and pharmacokinetics for a diagnostic probe
- To list the most common molecular targets for imaging
- To list the most commonly used tracers in molecular imaging
- To have an appreciation of the methods of molecular imaging, including its potential application to oncology, cardiovascular imaging, neurology and drug delivery
- To have a basic understanding of the strategies of gene therapy, including gene replacement, gene repair and silencing, and of cell therapy
- To have an understanding about chemistry and biotechnology methods relevant for probe development
- To understand PET image analysis and data processing
- To have an appreciation of hybrid imaging, e.g. PET/CT, PET/MR

SKILLS

- To choose the optimal contrast medium for common clinical indications for all types of imaging studies
- To be able to perform an emergency treatment for adverse reactions to contrast media when required
- To identify patients at risk of contrast media nephrotoxicity
- To take measures to reduce the risk of contrast nephrotoxicity
- To take precautions in diabetics taking metformin and requiring intravascular administration of contrast media
- To take measures to reduce the risk of contrast media nephrotoxicity
- To identify patients at risk to develop NSF
- To choose optimal exposure parameters for radiographic imaging
- To choose optimal acquisition parameters for common CT applications
- To choose optimal MR sequences for common indications for MR imaging
- To choose the appropriate ultrasound transducer according to the organ imaged
- To choose optimal imaging parameters in ultrasound and Doppler sonography
- To obtain Doppler spectra on the various vessels of the body

COMPETENCES AND ATTITUDES

- To choose optimal imaging parameters for all imaging technologies
- To make informed purchasing decisions for imaging equipment for a radiological department respecting imaging technology, radiation protection and budget restrictions
- To devise strategies to reduce artefacts on conventional radiography, fluoroscopy, CT, MRI and ultrasound
- To appreciate the effect of the properties of the machine/scanner on image quality and to optimise the image quality for the machine/scanner available for all common imaging indications
- To appreciate the effect of the properties of image recording and display and to optimise the image quality in the available setting for all common imaging indications
- To appreciate the impact that image quality has on clinical performance and to enhance image quality to the best extent possible
- To confidently devise and conduct quality assurance programmes

Upplýsingatækni tengd myndgreiningu (B-I-16)

Í þessum hluta námsins er miðað við að sérnámslæknir nái að tileinka sér og nota þau upplýsinga- og myndúrvinnslukerfi sem notuð eru á deildinni hverju sinni. Einnig er æskilegt að sérnámslæknir geti nýtt þverfagleg upplýsingakerfi s.s. Heilsugátt eða Sögu til samskipta við annað heilbrigðisstarfsfólk. Ekki er fjallað ítarlega um þróun og uppbyggingu hugbúnaðar og upplýsingartækni heldur fremur að öðlast færni til að nota þau kerfi sem í boði eru hverju sinni.

Varðandi ýtarlegri markmið á áfanga B-I-16 vísast í marklýsingu ESR:

KNOWLEDGE
• To understand the basic techniques of PACS, automated dictation (speech recognition), and medical information systems (EMR and HIS)
• To list the informatics standards, including DICOM, HL7 and their appropriate accomplishment following IHE recommendations; to be aware of the role of the IHE in using such standards
• To know the medical digital image formats
• To have a basic knowledge of monitor requirements for different imaging modalities.
• To have a basic knowledge of network of computers, digital networks and cloud services, including security issues.
• To have a basic knowledge of databases.
• To have a basic knowledge of different options for long-term storage of digital data.
• To have a basic knowledge of image processing (3D, multiplanar, MIP, volume rendering...)
• To have a basic knowledge of digital structured reporting and structured report coding
• To have a basic knowledge of principles and regulations of data privacy
• To have a knowledge of online searches with Pubmed, Google scholar
• To have a knowledge of web-portals for patients and their application for radiology
• To know how to secure communication by e-mail and dedicated messaging services
• To have a knowledge of safe and secure use of social networks (social media) with knowledge of privacy issues
• To have a basic knowledge of online CME
• To know basic principles of digital radiography, computed radiography and digital image acquisition
• To know how to implement image distribution using portable media
• To know how to explain e-learning tools
• To discuss relevant aspects of teleradiology and telemedicine
• To have an understanding of structured reporting

SKILLS

- To develop general computer skills
- To know how to use electronic communication skills
- To know how to use of computers for clinical presentations
- To know how to use of structured reporting applications
- The know the use of RIS and HIS for accessing patients' clinical data and prior examinations
- To know how to use advanced postprocessing (e.g. 3D reconstruction) workstation functions
- To ensure that the PACS monitor is displaying the data appropriately
- To know how to communicate with the technological support when systems fail (diagnostic equipment, workstations, servers, RIS/PACS, etc.)
- To know how to use e-learning tools
- To know how to route studies and manual sending of images

COMPETENCES AND ATTITUDES

- To know how to use these tools to improve images and facilitate diagnosis
- To know how to use these tools in the benefit of the patients
- To know how to use these tools to provide an actionable report

Samskipti og stjórnun (B-I-17)

Sá hluti sérnámsins sem við kemur samskiptum byggir á eftirtöldum meginþáttum:

1. Að geta útbúið skilmerkilega og hnitmiðaða greinargerð á túlkun myndrannsókna (röntgensvör)
2. Að koma áríðandi niðurstöðum fljótt og örugglega til lækna og tengdra aðila byggt á aðstæðum, bakgrunni, mati og ábendingum SBAR (Situation, Background, Assessment and Recommendation)
3. Að byggja upp færni í samskiptum við sjúkling og aðstandendur. Samskipti þurfa að byggja á samhygð (e. empathy) og trúnaði ásamt virðingu fyrir rétti sjúklinga til upplýsinga og ákvarðanatöku á forsendum sjúklingsins sjálfs
4. Að betra virðingu fyrir ólíkum menningarhópum og fjölbreytni svo sem vegna aldurs, kyns, uppruna, trúar og kynhneigðar, og persónulegum nálgunarmöguleikum eða takmörkunum vegna þess.
5. Að byggja upp færni til munnlegra og skriflegra samskipta við aðra lækna, heilbrigðisstarfsfólk og aðra tengdra aðila og í þeim bera virðingu fyrir þekkingu þeirra og hæfni.
6. Að byggja upp færni til að upplýsa og kenna sjúklingum, aðstandendum, öðrum læknum, öðrum samstarfaðilum og nemum á ólíkum sviðum heilbrigðisvísinda.

Hinn hlutinn snýr að stjórnunarhæfni og byggir á eftirtöldu:

1. Að öðlast færni til að annast handleiðslu annarra lækna, nema og samstarfsaðila.
2. Að byggja um færni til að taka forustu í samvinnu, samskiptum og gæðastjórnun við samstarfsaðila og meðferðarteymi.
3. Að þekkja uppbyggingu heilbrigðiskerfisins, skipulag, boðleiðir og stjórnun þess.
4. Að þekkja lög og reglur um heilbrigðisþjónustu, heilbrigðisstarfsfólk og sjúklinga.
5. Að geta tekið ábyrgð á eigin starfsþróun og þekkingaröflun.

Varðandi ítarlegri markmið á náfanga B-I-17 vísast í marklýsingu ESR:

KNOWLEDGE

- To be familiar with the principles of communicating bad news
- To have an in-depth understanding of the nature, structure and medicolegal aspects of radiological reporting
- To understand the importance of timely communication with referring doctors with regard to imaging reports
- To understand the important role of the radiologist in multidisciplinary meetings and tumour boards
- To know the basic principles of communication in multidisciplinary meetings, including an appreciation of the transfer of knowledge, demonstration of imaging findings, and awareness of treatment consequences
- To understand the basic didactic principles of teaching radiology
- To describe the principles of administration and management as applicable to a clinical imaging department with multidisciplinary staff and high-cost equipment
- To be familiar with the procedures, legalities, critical evaluation processes and priorities required for systems purchase
- To understand the principles of teleradiology and its potential role and legal implications
- To understand the methodology and principles of the clinical audit with honesty and integrity, full agreement and confidentiality
- To understand the concept of measured performance and the comparison with target standards
- To interpret the results of audit measurements, the process of implementing change and the re-measurement of performance
- To understand the limitations of the selection of appropriate target standards
- To describe relevant country-specific legal implications of audits
- To appreciate the concepts of consensus statements from learning bodies and the methodology for sourcing them
- To understand the medico-legal implications of radiological practice
- To understand the concept of perceptual errors
- To be aware of the risk and consequences of missed radiographic diagnoses
- To be familiar with concepts to minimise radiological risk
- To have an in-depth understanding of more common radiological pitfalls
- To be familiar with the concepts of uncertainty and error in radiological practice
- To describe the concept of hindsight bias
- To understand the importance of the comparison with previous examinations
- To be aware of the specific liabilities relating to screening
- To have a basic understanding of health economics

SKILLS

- To formulate a comprehensive radiological report according to accepted standards
- To use an adequate terminology for the respective clinical question
- To perform cost–benefit and cost–efficiency evaluations for common imaging strategies
- To perform audits of structure, process and outcome
- To teach undergraduate students or other trainees relevant radiological knowledge and skills

COMPETENCES AND ATTITUDES

- To relate to the patient and their families with respect, honesty and confidentiality
- To be able to explain diagnostic imaging examinations and interventional procedures to the patient and to obtain informed consent
- To be able to explain examination results to patients and/or their families when appropriate
- To properly communicate with referring clinical colleagues
- To distinguish between routine methods of communication, and the necessity for immediate reporting of emergency, life-threatening or unexpected findings
- To timely and adequately communicate urgent or unexpected findings

Rannsóknir og gagnreynd læknisfræði (B-I-18)

Í þessum hluta sérnámsins eru eftirfarandi atriði höfð að leiðarljósi:

1. Að kunna skil á vísindalegri aðferðafræði innan læknisfræðinnar.
2. Að byggja á gagnreyndri læknisfræði við mat og ákvarðanatöku í daglegu starfi.
3. Að vera vakandi fyrir nýjungum sem stuðlað geta að bættum verkferlum og skilvirkni í starfi.
4. Að hafa grunnþekkingu á þeim skuggaefnum sem notuð eru við myndgreiningu, kostum þeirra og mögulegum skaðlegum áhrifum. Einnig að meta áhættu þeirra og bregðast við aukaverkunum þeirra (sá nánari lýsingu áfanga B-I-15).
5. Að hafa þekkingu á sýkingavörnum, smitgát og hvernig viðhafa þarf almennt hreinlæti innan starfa á myndgreiningardeild.

Varðandi ítarlegri markmið á áfangaB-I-18 vísast í marklýsingu ESR:

KNOWLEDGE

- To understand the basic elements of scientific methods and evidence-based medicine
- To have an in-depth understanding of design and data analysis for technical and diagnostic performance studies, including the influence of disease prevalence and spectrum on sensitivity, specificity, accuracy, and predictive values as well as the use of ROC analysis in radiological studies
- To understand the statistics necessary for critical assessment of published radiological primary and secondary studies (i.e. meta-analyses, cost-effective analyses)
- To describe basic statistics used in studies comparing treatments (i.e. randomised controlled trials)
- To understand the principles and practice of clinical audit
- To have a basic understanding of didactic methods to teach radiology

SKILLS

- To present studies from the radiological literature in departmental meetings
- To perform basic biostatistical tests relevant to the radiological literature
- To perform a focussed literature search of the relevant radiological literature
- To perform clinical audit in a radiological department

COMPETENCES AND ATTITUDES

- To appraise the relevant radiological literature in a critical manner
- To plan and conduct research studies under supervision in a methodologically sound manner
- To understand the value and methods of evolving imaging technologies

FRAMVINDUSKRÁNING

Sérnámslæknir skal halda framvinduskrá (e.Portfolio). Þar skal skrá tíma á vinnustöðvum og sérstök sérhæfð læknisverk. Þar skal einnig skrá viðveru í fræðilegu námi á deildinni og námskeiðum í faginu ásamt faglegum fundum. Einnig skulu skráð skipulögð fræðsluerindi sem sérnámslæknir heldur, vísinda-, rannsókna- og gæðavinna og birtar greinar sem og útdrættir, erindi og veggspjöld, auk starfa við kennslu. Sjálfsnám og lestur um fræðilega þætti skal skrá þannig að nákvæmt yfirlit sé fyrir hendi um stöðu sérnámslæknisins, sem sé uppfært og vottað af sérnámshandleiðara a.m.k. á sex mánaða fresti. Tekið skal mið af þekkingaröflun með hliðsjón af þeim atriðum sem tiltekin eru B-I hluta marklýsingarinnar.

Mikilvæg forsenda við mat náms sérnámslæknis er að hann haldi góða skráningu á þeim verkefnum sem honum er treyst fyrir og þeim störfum sem hann sinnir. Sérnámslæknir skal afla sér þeirrar þekkingar og öðlast þá færni sem tilgreind eru þessari marklýsingu (1. þrep ESR). Þessi atriði skal skrá í rafrænu framvindubókina (e.Portfolio) sem sérnámshandleiðari og hefur eftirlit með. Þessi skráning mun svo liggja til grundvallar á mati á því hvort 1. þrepi sérnámsins sé náð eða ekki.

Nánari upplýsingar m.t.t. framvinduskráningar eru skrifaðar í viðhengi 1 („Nánari upplýsingar m.t.t. framvinduskráningar, handleiðslu og námsmats (á ensku)“.

HANDLEIÐSLA OG NÁMSMAT

Sérnámslæknar njóta handleiðslu sérfræðilæknis allan námstímann. Skal sérnámshandleiðarinn hafa lokið sérstakri vottaðri þjálfun í handleiðslu. Sérnámshandleiðari hefur umsjón með faglegri framþróun þess sérnámslæknisins/-lækna sem hann hefur í sinni umsjá.

Sérnámslæknir fundar með sérnámshandleiðara sínum með formlegum hætti á 3 mánaða fresti og skal sá fundur skráður í framvinduskrá (ePortfolio). Hér gefst tækifæri til þess að kanna námsframvindu, áhugasvið, líðan og virkni í starfi og hvernig best sé að vinna úr þeim vandamálum og leysa þær hindranir sem í veginum kunna að verða. Hér gefst einnig gott tækifæri til að fara yfir þau atriði í marklýsingunni sem upp á vanta og gera áætlun um hvernig megi bæta úr því. Sérnámshandleiðari skal að jafnaði ekki hafa fleiri en tvo sérnámslækna í sinni umsjá. Áætlað heildarfjöldi sérnámslækna á deildinni á LSH er því að hámarki 8 í hvert sinn m.t. núverandi aðstæðna.

Sérnámshandleiðari með stuðning yfirlæknis og kennslustjóra deildar metur námsþróun sérnámslæknis. Árleg framvindumat er til grundvallar og framkvæmt skv. leiðbeiningum í Gullbókinni. Ef niðurstaða námsmats er ófullnægjandi getur það leitt til lengingar á námstíma.

Lýsingar m.t.t. handleiðslu og námsmats eru skrifaðar í viðhengi 1 („Nánari upplýsingar m.t.t. framvinduskráningar, handleiðslu og námsmats (á ensku)“.

ÓFULLNÆGJANDI NÁMSFRAMVINDA

Vegna náinnar samvinnu deildarlæknis og sérfræðilækna gefast góð tækifæri til að fylgjast með framvindu náms og grípa fljótt inn í ef hindranir verða á veginum. Rík skylda hvílir á sérnámshandleiðara að hafa yfirsýn yfir framvindu sérnámslækna sem hann hefur í sinni umsjá hverju sinni, benda á vankanta eða önnur atriðisem kalla á frekara nám eða aðrar úrbætur. Ófullnægjandi námsframvinda getur leitt til lengingar á námstíma.

SAMVINNA VIÐ SÉRFRÆÐALÆKNA DEILDARINNAR

Sérnámslæknar starfa náið með sérnámshandleiðara sínum sem og öðrum sérfræðilæknum. Öll myndgreiningarsvör sérnámslæknis eru yfirfarin og undirrituð rafrænt af sérfræðilækni. Allar rannsóknir og inngrip framkvæmd af sérnámslækni eru sömuleiðis undir eftirliti sérfræðilæknis. Allar myndir úr ómskoðunum og gegnumlýsingarannsóknum framkvæmdum af deildarlækni eru vistaðar í PACS kerfi deildarinnar eins og aðrar myndrannsóknir og eru yfirfarnar af sérfræðilækni. Mikil nánd er milli sérnámslækna og sérfræðilækna í daglegu starfi deildarinnar og einnig á vöktum utan dagvinnu. . Starf á röntgendeild einkennist öðru fremur af tugum sjálfstæðra viðfangsefna daglega. Við það myndast tækifæri á stöðugri endurgjöf og ráðleggingum. Fyrir utan endurgjöf á myndgreinarsvör deildarlæknis gefst tækifæri til mats á verklegri færni hans og fræðilegri þekkingu.

SÉRFRÆÐIPRÓF

Sérnámslæknar gangast ekki undir sérstök próf að afloknu 1. þrepi sérnámsins. Í lok 2. þreps sérnáms stendur til boða að þreyta sam-evrópskt diplomapróf í læknisfræðilegri myndgreiningu, svokallað EDiR próf (European Diploma in Radiology). Prófið er haldið af European Board of Radiology og prófað er úr öllum atriðum almennrar myndgreiningar í samræmi við námskrá ESR, þ.e. þeirri sömu og þessi marklýsing byggir á.

Upprunalegt skjal:

Reykjavík 27. febrúar 2020

Jóhann Davíð Ísaksson,

röntgenlæknir og kennslustjóri á röntgendeild LSH

Endurskoðað:

Reykjavík 3. júni 2021

Enrico B. Arkink,

röntgenlæknir og kennslustjóri á röntgendeild LSH

Marklýsingin bíður samþykkis, yfirlæknis röntgendeildar, yfirlæknis sérnáms á LSH og umfjöllunar og samþykktar af stjórn Félags röntgenlækna.

Marklýsinguna skal endurskoða á 2 ára fresti að hið minnsta.

VIÐHENGI 1 - NÁNARI UPPLÝSINGGAR M.T.T. FRAMVINDUSKRÁNINGAR, HANDLEIÐSLA OG NÁMSMAT (Á ENSKU)

Log book

The resident in radiology shall keep a log book (*framvinduskrá*) to monitor his or her progress. A recognized electronical log book (e.Portfolio) from an external party (VREST, www.vrest.nl) will be used for this purpose, providing both the resident as well as the residency program director with a good overview on the resident´s progress. It will include the time worked at specific workplaces and specific specialized medical work. Attendance to theoretical education at the department as well as to courses and professional meetings will be recorded. Furthermore, it includes organized education lectures given by the resident, scientific work and published articles, as well as abstracts, talks and posters. This e.Portfolio should reflect the progress of the resident's educational program and also include information about progress interviews and other forms of feedback (f.i. 360 degree feedback, objective structured assessment of technical skills-forms, checklists before starting with shifts, completed courses, followed conferences, number of performed studies, etc.). The full information in the e.Portfolio of the resident's log book will only be accessible for the residency program director (*kennslustjóri*), the head of department, the resident´s tutor and the resident him- or herself. The use of an e.Portfolio approach instead of a conventional written document will make it possible for the resident to update the log book from home or elsewhere outside the teaching institution or regluar working hours, and to use the information in the log book for his or her future career. It also makes supervision and progress review better, allowing this to be done in real-time and before or at each meeting where educational progress is being monitored.
An important prerequisite for the assessment of a resident is that he or she maintains a good record of the tasks entrusted to him or her and the work he or she performs. The specialist doctor shall acquire the knowledge and acquire the skills specified in the goal descriptions (1st level ESR).

Capabilities in Practice

The resident will be reviewed using different instruments. Assessment of the resident's progress will not only be focussed on their advancing medical expertise, but should also be focused on the other 6 competencies as defined in the CanMEDS framework: communication, collaboration, organisation and leadership, scientific expertise and

knowledge, social responsibility, and professionalism. Most of these competencies will have to be evaluated during daytime working hours and shifts. In recent years, around Europe, both in radiology as well as other medical specialist training programs, the assessment of all individual competencies of the CanMEDS framework led to a lot of paperwork. Therefore, assessment should be focused on the level of functioning of the resident with regard to the relevant CanMEDS competencies in a holistic way, where the final goal of the training will be to meet a set of "entrustable professional activities (EPAs)" a.k.a. "Capabilities in Practice (CiPs), which will be further commented below and which have partially also been listed in Appendix 2 ("Hæfni í starfi").

Formative and summative assessment

Assessment will have to be divided into summative and formative assessment.

Summative assessment

Currently, the ESR does not provide examination possibilities for assessing the resident´s knowledge summatively by the end of his or her level 1 training, though acquisition of knowledge during the first three years of training should focus on participation in the exam for the European Diagnostic Radiological Diploma as offered by the European Board of Radiology, which requires residents to be at least in their 5th year of training (2nd level ESR) to be eligible for participation.

Formative assessment

The goal of formative assessment will be to give direct feedback to the radiology resident; to assess what is going right and what needs improvement, thereby guiding the radiology resident in their developmental tract. Summative assessment is a more formal way of testing to make decisions about the progress of the residents. Regular and systematic explicit feedback to ensure a safe learning and working climate requires an active commitment by all radiologists involved in the resident's training. The resident, however, is primarily responsible for acquiring this feedback and to save the feedback in his or her log book (*framvinduskrá, e.Portfolio*).

Progression survey

On a two-monthly basis (so six times year, by the end of February, April, June, August, October, and December), a request will be sent out to two of the clinical supervisors involved in the resident's training (ideally non-mentors) to fill in a electronical survey (Appendix 3, "Eyðublað fyrir námsmat sérnámslækna") on the resident's progression, assessing all 7 competences as defined in the CanMEDS framework using three-level scaling (above-level; on-level; under-level). This thus will result in approximately 12 evaluations per resident per year. The radiologists who will be asked for their opinion, should be preferably those with whom the resident has worked extensively in the previous two months, based on the rotations they have been taking and/or because of co-working during shift times. The

resident should be assessed with regard to the level of training he/she has had so far. The assessment forms for these surveys will be based on rating scales widely used in Britain and the Netherlands as issued by the Royal College of Radiologists and the Radiological Society of the Netherlands, respectively. Results of these surveys will be saved in the resident's electronic log book (e.Portfolio) and will be the basis for progress interviews/evaluations.

360 degree feedback
Once a year, to be held at the beginning of year 2 and 3 of the residency training in Iceland, a similar survey will be sent out to other colleagues in the resident's sphere of influence (f.i. radiologists, peer radiology residents, radiographers, other staff members) for a 360 degree feedback. This tool provides timely, consolidated feedback from other sources than the usual peer review process.

Feedback questionnaire on educational program

A questionnaire is sent out to the residents (in February) to ask their opinion about the quality of the residency educational program, and thus to get their feedback in order to further improve the quality of the program in the Landspitali departments.

Tutoring and progress interviews
Resident doctors enjoy the guidance of a tutor (sérnámshandleiðari) throughout their training. The tutor must have completed special certified training in tutoring. The tutor oversees the professional development of the residents he or she is in charge of. The resident meets with his tutor formally ideally every three months (app. 30 minute session) and that meeting shall be registered in the progress log book (e.Portfolio). The program director meets the tutors twice a year (f.i. in the first week of December and June, app. 60 minute session) to discuss the residents´ progress. Shortly thereafter, there will be a progress interview with each resident with the director of teaching (*kennslustjóri*) attending as well at least twice a year. These individual evaluations will be documented in the e.Portfolio. The meetings with the tutor are an opportunity to assess academic progress, areas of interest, well-being and activity at work and how best to work out the problems and solve obstacles that may arise. When the resident is not meeting the goals for training, caveats may be detected in a timely manner and a plan can be arranged to improve on them before the Annual Review of Competency progression (ARCP, árlegt framvindumat), or after this. As a rule, the tutor shall ideally not have more than two residents in his or her care. A tutor evaluates the study development of the resident in close collaboration with the head of department and the program director for teaching. One of the progression interviews will be used to formally assess the trainee´s progress in terms of whether they can advance to the next year in training or the second part of the residency program abroad (Annual Review of Competency progression (ARCP, árlegt framvindumat)). If the assessment result is unsatisfactory, it can necessitate extension of the training period.

The final goal for the first three years of basic training (the “common trunk”, 1st level ESR) in LSH should therefore be concluded by setting a list of “Capabilities in Practice (CiPs)” to assess the resident’s individual level of competency on all aspects of becoming a radiology specialist. General CiPs have been partially mentioned in Part B-1 of the ESR curriculum, and further CiPs have been specified in Appendix 2. This set of CiPs will be a primary base for the resident’s continued education abroad (2nd level ESR) and therefore should be individualized based on the resident’s capabilities and wishes in regard to their future medical educational career. For the majority of these CiPs, the maximum level of proficiency to be reached during the training period in the LSH will be level 3. These CiPs will be logged in the e.Portfolio.

Specification of competency levels		
Level	Description	Level of required supervision
1	Novice, the resident has knowledge of the matter, is entrusted to observe only	Resident is not allowed to act individually, requires support and guidance throughout in acquisition and reporting
2	Developing, lesser proficiency; the resident is entrusted to act with direct supervision	Active supervision; all examinations are supervised and physical presence necessary when technical skills are applied (proactive supervision)
3	Developing, more proficiency; the resident is entrusted to act with indirect/minimal supervision	Supervision is given on demand (reactive supervision), though still with a low threshold (level required when supervisor is not physically present within the hospital, but supervision available through telephone and/or electronic media; physical presence may still be demanded)
4	Fully proficient: entrusted to act unsupervised	The resident works at the level equivalent to a consultant radiologist
5	Entrusted to supervise other residents	The resident works at a level superior to a consultant radiologist and supervises other residents in the role of a teacher

References:

- The Royal College of Radiologists, Clinical Radiology Specialty Training Curriculum 2020 (Implementation by: 01.08.2021) – www.rcr.ac.uk
- CanMEDS Framework – https://www.royalcollege.ca/rcsite/canmeds-e
- Opleidingsplan Radiologie HORA – NVVR, December 2010 – www.radiologen.nl
- Opleidingsplan Radiologie CORONA – NVVR, Juli 2020 – www.radiologen.nl
- European Training Curriculum for Radiology – Curriculum for the level I TRAINING Program (Years 1-3) – edition February 2020 – www.myesr.org

VIÐHENGI 2 – HÆFNI Í STARFI (Á ENSKU)

This appendix describes the „capabilities in practice (CiPs)“ to assess the resident’s individual level of competency on all aspects of becoming a radiology specialist. The different CiPs have been linked to the curriculum themes as described earlier in this goal description under the header „Kennsluskrá (Marklýsing B-1 hluta ESR)“. Since the CiPs for some investigations and activities cover different themes of radiology, they may be listed more than once in the different lists.

B-I-1 BreastRadiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Mammography	x	x						1	2	2	*
Breast MRI	x	x						1	2	2	*
Breast ultrasound	x	x						1	2	2	*
Interventional procedures, specialistic (sampling, biopsy, localisation, drainage)	x	x						1	2	2	*
General											
Multidisciplinary meetings		x	x		x		x	1	1	1	x

B-I-2 Cardiac and Vascular Radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Chest X-ray	x	x						3	3	3	*
Acute CT (aortic dissection, aneurysm, PE)	x	x						2	3	3	*
CTA / MRA vessels	x	x						2	2	3	*
CTA specialistic (EVAR, TAVI)	x	x						1	1	2	*
Cardiac CT *(not performed in our department)*	x	x						1	1	1	*
Cardiac MRI *(not performed in our department)*	x	x						1	1	1	*
Vascular ultrasound (AAA, DVT)	x	x						2	3	3	*
Myocardial perfusion scintigraphy	x	x						1	1	2	*
General											
Radiology meetings (ICU round, interventional vascular round)		x	x		x		x	1	2	2	*

B-1-3 ChestRadiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Chest X-ray	x	x						3	3	3	*
CT chest general (infection, airways, COPD)	x	x						2	3	3	*
CT chest oncology (tumor staging)	x	x						2	2	2	*
CT chest specialistic (ILD, vascular diseases, pulmonary hypertension)	x	x						2	2	2	*
FDG-PET/CT lung/mediastinum	x	x						1	2	2	*
Lung perfusion scintigraphy	x	x						1	2	2	*
Interventional procedures, standard (diagnostic sampling)	x	x	x					1	2	2	*
Interventional procedures, specialistic (biopsy, pleural drain)	x	x	x					1	2	2	*
General											
Radiology meetings (ICU round, lung round, thoracic surgery round)		x	x		x		x	1	2	2	*
Multidisciplinary meeting (tumor lung round)		x	x		x		x	1	1	1	*

B-1-4 EmergencyRadiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
X-ray (thorax, abdomen)	x	x						3	3	3	*
CT acute (f.i. trauma, dissection, pulmonary embolism, etc.)	x	x						2	3	3	*
Ultrasound acute	x	x						3	3	3	*
MRI acute	x	x						1	2	2	*
General											
Radiology meetings (ICU round)		x	x		x		x	1	2	2	*

B-I-5 Gastrointestinal and Abdominal Radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
X-ray (abdominal overview)	x	x						3	3	3	*
X-ray (passage)	x	x						2	3	3	*
Fluoroscopy (f.i. oesophagography, gastrography)	x	x	x					2	2	3	*
Fluoroscopy, specialistic (defecography)	x	x	x					1	1	1	*
CT abdomen (acute)	x	x						3	3	3	*
CT abdomen (non-urgent abdominal problems, oncology)	x	x						2	3	3	*
Ultrasound abdomen (acute)	x	x						3	3	3	*
Ultrasound abdomen (specialistic, f.i. advanced duplex examinations)								1	2	2	*
MR abdomen (MRCP, appendicitis)	x	x						1	2	2	*
MR abdomen (liver/gall bladder pancreas, GE, rectum)	x	x						1	2	2	*
FDG-PET/CT abdomen	x	x						1	2	2	*
Interventional procedures, standard (diagnostic sampling)	x	x	x					1	2	2	*
Interventional procedures, specialistic (biopsy, ascites drain)	x	x	x					1	2	2	*
General											
Radiology meetings (surgical round, hematological round)		x	x		x		x	1	2	2	*
Multidisciplinary meeting (abdominal tumor round)		x	x		x		x	1	1	1	*

B-I-6 Gynaecological and Obstetric Radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Fluoroscopy (hysterosalpingography)	x	x	x					1	1	1	*
CT abdomen (oncology, pelvimetry)	x	x						2	2	3	*
Ultrasound, transabdominal	x	x						3	3	3	*
Ultrasound, transvaginal	x	x						1	1	1	*
MR abdomen (oncology)	x	x						1	2	2	*
FDG-PET/CT abdomen	x	x						1	2	2	*
Interventional procedures, standard (diagnostic sampling)	x	x	x					1	2	2	*
Interventional procedures, specialistic (biopsy, ascites drain)	x	x	x					1	2	2	*
General											
Radiology meetings (gynaecological round)		x	x		x		x	1	2	2	*

B-I-7 Head & neck radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Fluoroscopy, general (oesophagography, swallowing videos)	x	x	x					2	2	3	*
Fluoroscopy, complex (sialography, dacryocystography)	x	x	x					1	1	1	*
CT head-neck general (sinusitis, temporal bone)	x	x						2	3	3	*
CT head-neck oncology (tumor staging)	x	x						2	2	3	*
MRI head-neck	x	x						2	2	3	*
Ultrasound neck	x	x						2	3	3	*
Thyroid scintigraphy	x	x						1	2	2	*
Parathyroid scintigraphy	x	x						1	2	2	*
Interventional procedures, standard (diagnostic sampling lymph nodes, thyroid nodules)	x	x	x					1	2	2	*
General											
Radiology meetings (head & neck)		x	x		x		x	1	2	2	*
Multidisciplinary meeting (tumor head & neck round, pituitary round)		x	x		x		x	1	1	1	*

B-I-8 Interventional radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Acute CT (aortic dissection, aneurysm)	x	x						2	3	3	*
CTA / MRA vessels general	x	x						2	2	3	*
CTA specialistic (EVAR, CTA abdominal arteries and legs)	x	x						1	1	2	*
Ultrasound vessels, specialistic (Doppler exams, fistula evaluation, carotis stenoses)	x	x						1	2	2	*
Vascular interventions											
Peripheral artery disease intervention	x	x	x					1	1	2	*
Venous interventions (shunts, vascular access lines)	x	x	x					1	1	2	*
Embolisations, TIPS, intra-arterial thrombectomy, tumor embolisations	x	x	x					1	1	1	*
Non-vascular interventions											
Diagnostic sampling (fluid, cytology)	x	x	x					2	3	3	*
Diagnostic sampling (histology)	x	x	x					1	2	2	*
Drainage (abscess, ascites, other fluid collections)	x	x	x					1	2	2	*
Liver & biliary tract interventions (gallbladder drainage, PTCD)	x	x	x					1	1	2	*
Urological tract (nephrostomy, JJ-catheter insertion)	x	x	x					1	2	2	*
Oncology (ablations)	x	x	x					1	1	1	*
General											
Radiology meetings (interventional vascular round)		x	x		x		x	1	1	2	x
Multidisciplinary meetings		x	x		x		x	1	1	1	x

B-I-9 Musculoskeletal radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
X-ray	x	x						3	3	3	*
Fluoroscopy (arthrography)	x	x	x					2	2	3	*
CT MSK, general (trauma, infection)	x	x						3	3	3	*
CT MSK, complex (primary bone tumours, orthopaedics)	x	x						2	2	2	*
MR MSK, general (knee, spine)	x	x						1	2	2	*
MR MSK, complex (primary bone tumours)	x	x						1	2	2	*
Ultrasound, general (f.i. hydrops)	x	x						2	3	3	*
Ultrasound, complex (f.i. joints, rotator cuff pathology, etc.)	x	x						1	2	2	*
Interventional procedures, standard (diagnostic sampling hydrops)	x	x	x					1	2	2	*
Interventional procedures, complex (bone sampling)	x	x	x					1	1	2	*
Skeletalscintigraphy	x	x						1	2	2	*
General											
Radiology meetings (neurology, neurosurgery, head & neck)		x	x		x		x	1	2	2	*
Multidisciplinary meeting (tumor head & neck round, pituitary round)		x	x		x		x	1	1	1	*

B-I-10 Neuroradiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
X-ray (skull, VP drain)	x	x						3	3	3	*
CT brain	x	x						3	3	3	*
CTA/CTV brain (acute, f.i. stroke, sinus thrombosis)	x	x						3	3	3	*
CT vascular, complex (4D CTA, non-stroke vascular pathology)	x	x						2	2	2	*
CT spine (fracture, spinal canal stenosis)	x	x						3	3	3	*
MR brain, general (ischemia)	x	x						1	2	3	*
MR brain, complex (f.i. oncology)	x	x						1	2	2	*
MR spine	x	x						1	2	2	*
Ultrasound head (neonatal)	x	x						2	2	2	*
Neurodegenerative functional imaging (DAT scan, FDG PET)	x	x						1	2	2	*
General											
Radiology meetings (neurology, neurosurgery)		x	x		x		x	1	2	2	*
Multidisciplinary meeting (tumor pituitary round)		x	x		x		x	1	1	1	*

B-I-11 PaediatricRadiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
X-ray, general (thorax, abdomen, MSK)	x	x						3	3	3	*
X-ray, complex (non-accidental injury, dysplasia)	x	x						1	2	2	*
Fluoroscopy (colonography, micturating cystourethrogram, etc.)	x	x						2	2	3	*
CT acute	x	x						3	3	3	*
CT specialistic	x	x						2	2	3	*
Ultrasound head (neonatal)	x	x						2	2	2	*
Ultrasound neck, MSK	x	x						2	3	3	*
Ultrasound abdomen	x	x						3	3	3	*
MRI	x	x						1	2	2	*
General											
Radiology meetings (paediatrics)		x	x		x		x	1	1	2	x

B-I-12 Urogenital Radiology	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
X-ray (kidney stones)	x	x						3	3	3	*
Fluoroscopy (f.i. micturating cystourethrogram, pyelography, etc.)	x	x						2	2	3	*
CT abdomen (acute, f.i. kidney stones)	x	x						3	3	3	*
CT abdomen (urography and oncology)	x	x						2	3	3	*
Ultrasound kidneys and bladder	x	x						3	3	3	*
MR abdomen (kidneys, prostate)	x	x						1	2	2	*
FDG-PET/CT abdomen	x	x						1	2	2	*
Kidney scintigraphy	x	x						1	2	2	*
Interventional procedures, specialistic (biopsy, ascites drain, nephrostomy)	x	x	x					1	2	2	*
General											
Radiology meetings (surgical round, urological round, gynaecological round, hematological round)		x	x		x		x	1	2	2	*
Multidisciplinary meeting (urology tumor round, abdominal tumor round)		x	x		x		x	1	1	1	*

B-I-13 NuclearMedicine	CanMEDS competencies							Capabilities in Practice (CiP)			
								1st level ESR			2nd level ESR
	Medical expertise	Communication	Collaboration	Knowledge and scientific expertise	Social responsibility	Organisation	Professionalism	Year 1	Year 2	Year 3	ABROAD
Cardiothoracic											
Myocardial perfusion scintigraphy	x	x						1	1	2	*
Lung perfusion scintigraphy	x	x						1	2	2	*
Endocrinology											
Thyroid scintigraphy	x	x						1	2	2	*
Thyroid, I-131 therapy	x	x						1	1	1	*
Parathyroid scintigraphy	x	x						1	2	2	*
Kidney scintigraphy	x	x						1	2	2	*
Neurology											
Neurodegenerative functional imaging (DAT scan, FDG PET)	x	x						1	2	2	*
Oncology & musculoskeletal											
Skeletalscintigraphy	x	x						1	2	2	*
Lymph node scintigraphy	x	x						1	2	2	*
Scintigraphy, other (f.i. detection neuroendocrine tumors)	x	x						1	2	2	*
FDG PET	x	x						1	2	2	*
General											
Radiology meetings		x	x		x		x	1	1	2	x
Multidisciplinary meetings		x	x		x		x	1	1	1	x

VIÐHENGI 3–EYÐUBLAÐ FYRIR NÁMSMAT SÉRNÁMSLÆKNA

Sérnámslæknir:
Matsmaður:
Dagsetning:
Tímabil:

I. Læknismeðferð

- Sérnámslæknir túlkar spurningu beiðandi læknis rétt;
- Sérnámslæknir velur rétta rannsókn m.t.t. sjúklings, spurningar og tímasetningar;
- Sérnámslæknir framkvæmir rannsókn rétt;
- Sérnámslæknir greinir mikilvægar niðurstöður;
- Sérnámslæknir skrifar skipulagt og skýrt svar.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemdir:

II. Samskipti

- Sérnámslæknir ræðir læknisfræðilegar upplýsingar á skýran og skiljanlegan hátt við sjúkling og fjölskyldu;
- Sérnámslæknir ráðfærir sig við viðkomandi samstarfsmenn;
- Sérnámslæknir miðlar mikilvægum niðurstöðum tímanlega.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemdir:

III. Samstarf

- M.t.t. samstarfsmanna á deildinni (aðrir læknir, geislafræðingar, geislafræðinemar, skrifstofumenn, heilbrigðisritarar, sérhæfðir starfsmenn, o.s.frv.).
- M.t.t. samstarfsmanna á öðrum deildum spítalans.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemdir:

IV. Þekking og vísindaleg þekking

- Sérnámslæknir hefurnæga bakgrunnsþekkingu;
- Sérnámslæknir innleiðir nýjar hugmyndir.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemdir:

V. Félagsleg ábyrgð

- Sérnámslæknir þekkir viðeigandi reglugerðir;
- Sérnámslæknir þekkir kosti og galla starfs hans m.t.t. sjúklings og samfélags.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemdir:

VI. Skipulag

- Sérnámslæknir les úr rannsóknum eftir bráðleika;
- Sérnámslæknir greinir á milliaðal- og aukaatriða;
- Sérnámslæknir er duglegur í sinni tímastjórn.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemdir:

VII. Fagmennska

- Sérnámslæknir les veitir góða læknisþjónustu;
- Sérnámslæknir sýnir faglega framkomu;
- Sérnámslæknir þekkir sínar takmarkanir (sjálfsspeglun);
- Sérnámslæknir er einlægur, kurteis og heiðarlegur.

Ófullnægjandi		*Fullnægjandi*		*Yfir meðallagi*
1	*2*	*3*	*4*	*5*

Athugasemda:
