NHS Connecting for Health	Clinical Imaging Data Sharing Requirements			
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Clinical Imaging Data Sharing Requirements

Amendment History:

Version	Date	Amendment History
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V0.2 – V0.4	26/01/07	Working Drafts modified in line with comments received following review closing 23/01/07. See CRS NPFIT-PAC-DES-199.02 for consolidated comments and responses.
V0.5	13/02/07	Title change and revision following clinical co-authorship review.
V0.6	22/02/07	Updated document following NHS PACS Technical Team and Cluster Technical Architect Review.
V0.7	19/03/07	Updated document following PACS Board, RCR Technical subcommittee and Cluster Clinical Reference Group Review.
V0.7.1	21/03/07	Minor update following NEEM PACS data sharing workshop.
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Reviewers:

This document must be reviewed by the following.

Name	Signature	Title	Date of Issue	Version
PACS Technical Team		PACS Technical Team	13/02/07	0.5
PACS Cluster Technical Architects		PACS Cluster Technical Architects	13/02/07	0.5
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Approvals:

This document requires the following approvals.

Name	Signature	Title	Date of Issue	Version
Mary Barber		PACS Programme Head	27/03/07	1.0
Dr. Erika Denton		Chair of PACS Board	27/03/07	1.0

Document Location

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Contents

1 Introduction

1.1 Background

Following discussions associated with the requirements of the PACS and RIS systems to support record sharing activities between organisations, there is a need to document a consolidated set of requirements to support LSPs in developing the services they deliver against, in line with the existing OBS.

An initial requirements capture workshop was held in London on the 9th and 10th of January 2007; this workshop comprised of representation from the LSPs in the NWWM and the Southern Cluster, CSCA and FJA respectively, their PACS and RIS vendors, GE and HSS. Representation from PACS service managers from both clusters was also present. Clinical representation was available on the second of the two days to further develop work conducted on the first. The workshop was lead and facilitated by the NHS CFH PACS Cluster and Central Team. This document captures the output of the workshop and subsequent clinical input on document review.

Further input is required to refine the requirements within this document and it is intended that this document shall be thoroughly reviewed by the clinical community and owned by the National PACS Board. The document will be co-authored by the PACS Technical Team and Clinical representatives to ensure that the requirements documented are true and accurate.

1.2 Purpose

The purpose of this document is to capture at a high level the core clinical imaging business processes and a consolidated set of requirements to support clinical imaging data sharing workflows.

The intention is that this document will serve as a template to enable a gap analysis to be performed with existing technical solution architectures, system functionality and operational procedures. This will enable Local Service Suppliers (LSPs), NHS Connecting for Health (CFH) and Clinical Expert Reference Groups (ERGs) to assess a range of options to meet the required business processes. Where these require change to system architecture or system functionality, these will be managed through dialogue between NHS CFH and LSPs in parallel with the new functional requirements processes.

1.3 Scope

The scope of this document is limited to the business processes within clinical imaging workflows associated with sharing data across organisational boundaries.

1.4 Audience

This document is to be read by the clinical, management and administrative user communities who interact with the systems associated with clinical imaging workflow, and the service providers who deliver clinical imaging information systems.

1.5 Definitions

1.5.1 Information Objects

A **Requested Procedure** is defined in DICOM. For the purpose of this document a single requested procedure is associated with a single DICOM study and a number of associated reports. A Requested Procedure code is a national imaging procedure code and description as defined in the code set produced by the National Clinical Imaging Management Group.

A **Study** is a DICOM study which may comprise images, structured reports, and other DICOM objects as specified in the DICOM standard. Study objects may be produced at different times, on different pieces of equipment, before, during or after production of an initial report.

A **Report** is a formal observation documented by a Reporting Clinician on a Requested Procedure.

A **Procedure Step** is defined in DICOM as a modality or a general purpose procedure step. For the purposes of this document a Procedure Step is a service activity performed in relation to a Requested Procedure. This may include primary image acquisition, post processing and secondary image acquisition, primary reporting, secondary reporting etc.

An **Imaging Service Request** (ISR) is defined in DICOM. For the purposes of this document an ISR is a clinical referral (order) for an imaging service. A single Image Service Request may contain one or more Requested Procedures, each requiring one or more Procedure Step activities. Each Requested Procedure may be a new Requested Procedure (e.g. for primary image acquisition and reporting) or an existing Requested Procedure (e.g. for secondary reporting and review)

1.5.2 Actors

The main Clinical Actors performing workflow activities are defined as follows. It should be noted the referrer, practitioner and operator are defined under the Ionising Radiation Medical Exposure Regulations (IRMER) 2000.

A **Referring Clinician** or **Referrer** is the clinician who makes an Imaging Service Request.

A **Practitioner** is the person who justifies an Imaging Service Request under the authority of the Acquiring Organisation. In radiology this is typically a radiologist or radiographer..

An **Operator** is a person responsible for performing Procedure Steps associated with Image Acquisition under the authority of the Acquiring Organisation. This may be a radiographer, a radiologist or another clinical specialist trained and competent to perform imaging procedures.

A **Reporting Clinician** is a clinical imaging specialist who produces a report on a requested procedure. This may be a radiologist, a reporting radiographer or another specialist clinician qualified to report imaging procedures.

A **Reviewing Clinician** is any clinician reviewing the study images and reports to form a clinical opinion and take any necessary action.

The main organisational actors performing clinical imaging workflow activities are defined as follows. Note some of these may be the same organisation depending upon the workflow use case.

A **Referring Organisation** is the organisation from which an Imaging Service Request originates

An image **Acquiring Organisation** is an Imaging Service Provider within which the Procedure Steps associated with study image acquisition and quality assurance are performed.

A **Reporting Organisation** is an Imaging Service Provider for the Procedure Steps associated with clinical reporting

A **Reviewing Organisation** is an Imaging Service Provider where Study Images and Reports are Reviewed

1.5.3 Terminology

The following key words are to be interpreted as described in RFC 2119.

MUST This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.

MUST NOT This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.

SHOULD This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.

SHOULD NOT This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behaviour described with this label.

2 Consolidated Clinical Imaging Data Sharing Requirements

The workshops have identified a consolidated set of clinical requirements to be considered in clinical imaging data sharing workflows. These requirements will be used to establish any gap in existing and proposed service provision, and provide the basis to perform a technical option appraisal with service providers in support of the requirements.

It is intended that the technical options appraisal should remain flexible, and could include any changes to the integrated solution architecture, system functionality and operational procedures required to support clinical imaging data sharing workflow requirements. The focus should be on optimising business workflow efficiency and patient safety to maximise the benefits of the PACS service. A standards based approach will be required in line NHS CFH specified technical frameworks to ensure requirements are interoperable across cluster boundaries, existing NHS systems and systems deployed by the Independent Sector.

At this stage, the consolidated clinical requirements below should be seen as clinical best practice requirements and assessed in conjunction with the clinical imaging data sharing workflows. Only following the subsequent discussion between LSPs, NHS CFH and Clinical ERGs will decisions be made on an agreed way forwards, which may or may not result in a change to existing contractual requirements. For the avoidance of doubt any contractual change would be based on a specific implementation plan arising as a result of the technical options appraisal above.

Table 2-1: **Consolidated Clinical Imaging Data Sharing Requirements**

Req No	Requirement
001	Study images and reports MUST remain associated at all times. Reports of a displayed study MUST be available via the user interface, by means of a single mouse click or equivalent. Study images SHOULD be made available through an automated direct link from the report so the user does not have to re-key patient or study data.
002	Study images and reports MUST be available on all PACS workstations, including diagnostic reporting and web review workstations. PACS workstations MUST display shared study images and formal reports in the same way as locally acquired studies with the same access to image manipulation tools, providing display is permitted within the information governance framework. It MUST be possible to display study images and formal reports from other organisations alongside locally acquired studies within the same application.
003	All images and reports MUST be available in line with existing SLAs. Any scheduled activity requiring access to shared data SHOULD trigger prefetch of the study and any relevant priors to enable timely access to the study images and reports. Prefetch SHOULD occur as soon as practicable after the request is scheduled to enable preliminary review. Any additional study objects acquired after scheduling SHOULD also be prefetched so that they are available at the time the scheduled activity is performed.
004	The service MUST provide worklists to support clinical imaging data sharing procedure step activities and workflows, including scheduled image acquisition, post processing, reporting and review. Where worklists are provided by a speciality information solution, e.g. RIS, selection of an item on the worklist MUST display the corresponding study images and reports on the PACS workstation used to display the shared image data.
005	The service MUST enable access to worklists across local organisation (actor) boundaries where these are required to support clinical imaging data sharing workflows. The service MUST be capable of providing worklists to third party systems and workstations through DICOM general purpose worklist.
006	The service SHOULD enable display of the full patient record of clinical imaging studies, irrespective of where the study images and reports are scheduled and acquired across the service. For each patient the study list SHOULD be sorted by imaging date and time, and display at a minimum the study date, procedure description, number of study images, and the study status (unreported/reported). It SHOULD be possible to use the clinical imaging record as a worklist as per the above requirements.
007	The service MUST enable an Imaging Service Request to be linked to one or more studies and

Req No	Requirement
	the associated reports. The clinical information included in the order MUST be made available wherever imaging procedures are justified, acquired and reported in record sharing activity workflows. The system MUST then enable the clinical referral information to be automatically included in the report so that it available on subsequent review.
008	The service MUST support an Imaging Service Request for the review of study images and reports that have already been acquired, as part of a formal imaging review or review at a Multidisciplinary Team Meeting. The imaging service request SHOULD be linked to the original requested procedures and studies, and SHOULD NOT create additional or duplicate studies in the process.
009	It MUST be possible to add any additional reports as logical addenda to the original report so that they appear in date order either with the most recent report displayed first, or with the most recent report displayed last with a warning notice before the original report. All reports MUST be issued to the Referring Clinician to fulfil the Imaging Service Request. If an addendum is added to a report, the whole report MUST be reissued to both the original Referring Clinician, and the Referring Clinician that requested the review.
010	The service MUST provide a 'Report Acknowledgement System' to enable the Referring Clinician, or another authorised clinician acting on their behalf, to view a worklist of their unacknowledged reports. The service MUST enable the referring clinician, or another clinician acting on their behalf, to electronically 'acknowledge' the report to remove it from the worklist. The Report Acknowledgement System must support an audit trail and status report to enable service providers to monitor that all reports are acknowledged in line with clinical guidelines.
011	The service MUST provide the facility to sort and display procedure step worklists by the priority status of each procedure to enable clinical actors to prioritise the more urgent exams at each step in the workflow. For example the reporting clinician MUST be able to flag a report as "Urgent" at the time of reporting. This flag must be communicated to the Referring Clinician and MUST highlight the report as "Urgent" in the Report Acknowledgement System worklist.
012	It MUST be permitted to permanently store any additional study objects and reports created following initial image acquisition, during primary clinical imaging and clinical imaging review workflows. These additional study objects and reports MUST be distributed with the initial study objects as a single composite study to any organisation where subsequent review is required. The service MUST enable access to the most up-to-date study data and MUST NOT allow duplicate or fragmented study objects to accumulate as a result of record sharing activities.
013	The service MUST ensure error correction procedures made to shared data are propagated to all Organisations that have accessed and subsequently access the data, subject to an appropriate clinical safety assessment. All additional objects created in association with a study (including presentation states and key image notes) MUST be communicated whenever studies are shared as these may contain clinically significant information relevant to image display and error correction procedures
014	The service MUST maintain an audit trail of all transfers and access to shared data in line with Information Governance requirements. The audit trail SHOULD identify the individual person, the organisation, and the date/time whenever studies are requested, acquired, reported and reviewed. It MUST be possible to record and/or otherwise determine which images were available to the reporting clinician when a report was created. The service SHOULD provide appropriate locally accessible data analysis and reporting tools to analyse audit data sharing activities for information governance, finance and charging purposes.
015	Where study images or reports originate from different organisations, the system MUST routinely display this information to the user. For each study object, the system MUST identify the organisation that created the object and when. Reports and report addenda MUST identify the reporting organisation, the reporting clinician and their registered speciality.
016	The service MUST interface with other Care Record Service applications where required to support clinical data sharing requirements and workflows. The service SHOULD also interface with existing solutions to enable clinical data sharing (e.g. existing teleradiology solutions), where the host organisations consider these offer additional clinical benefit.
017	Transfer of imaging data by teleradiology or portable media (e.g. CD) MUST follow a DICOM standard based approach to enable interoperability between systems. A self-launching DICOM viewer MUST be included on each portable media (e.g. each CD) for automatic viewing of the study images and reports. Study images and reports SHOULD be included in all transfers to maintain study and report integrity. The mechanisms for exporting and importing study images and reports SHOULD be automated as far as possible.

Req No	Requirement
018	The service MUST provide each organisation with the ability to import and archive study images and reports performed by other imaging service providers, including the independent sector. The PACS service MUST then provide access to these study images and reports in the same way as study images and reports acquired within NHS organisations. Import of study images and reports MUST ensure referential integrity is retained with NHS patient and study identifiers.
019	The service MUST support interface of PACS to teleconferencing and videoconferencing systems to support 'real time' synchronised review of imaging across multiple organisations, including support for Multidisciplinary Team Meetings.
020	The service MUST provide the facility to schedule study images and reports for review at Multidisciplinary Team Meetings. The service MUST provide each meeting with worklist to enable prior review of imaging studies and reports at all participant organisations, and to serve as a permanent record of the studies reviewed at each meeting.

3 Clinical Imaging Data Sharing Requirement Workflows

The following high level record sharing activities are captured within the document:

Primary Imaging Workflows
- Primary Clinical Imaging Workflow Overview
- Multi-Site Imaging Acquisition and Reporting Workflows

Imaging Review Workflows
- Informal clinical imaging review
- Formal clinical imaging review resulting in a formal report
- Imaging review at a multi-disciplinary team meeting

In each case the business activity workflow is described using clinical actors with example business use cases. These workflows are illustrated as UML activity diagrams in Appendix A.

The specific system actors (e.g. CRS, RIS and PACS) have been deliberately omitted from the workflows as these will be addressed in the subsequent technical options appraisal with the service providers, and inclusion may unduly constrain or prejudice the potential options.

The administrative processes and actors associated with data entry, booking and scheduling, worklist management, data import and export etc. have been omitted to simplify the workflow activity diagrams, where these are implicit in the workflow. The requirement for these will depend on system functionality and should be addressed with the technical options appraisal.

As a general principle there is benefit in automating system functionality that will reduce the administrative overhead, optimise clinical workflow, and enhance patient safety. It is recommended that all human actors should work from worklists where possible, as these have the potential to optimise clinical and administrative efficiency, and minimise clinical risk from patient selection errors. Where there are stepwise workflow activities which occur in sequence, completion of one activity should automatically place it on a worklist for the next activity.

3.1 Primary Imaging Workflows

Primary clinical imaging workflows relate to all activities involved in imaging a patient from the initial clinical referral, through image acquisition and reporting procedure steps, to review by the referring clinician or a member of their clinical team.

3.1.1 Primary Clinical Imaging Workflow Overview

The following description provides an overview of the clinical actors involved in the primary clinical imaging referral workflow, and highlights the information flow that must be retained between clinical actors irrespective of any organisational, commercial or technical boundaries. In some use cases the clinical actors may be combined, for example one person may perform the role of both practitioner and operator, but the clinical roles remain distinct.

A ***referring clinician*** makes an Imaging Service Request (ISR) to an imaging service provider. The ISR may contain one or more requested procedures from which a number of Procedure Step activities are inferred.
A ***practitioner*** will justify each Requested Procedure based on the clinical information provided in the Imaging Service Request, and may add information additional to the request for the attention of the operator and reporting clinician. An imaging appointment may be made on receipt of the referral and may be confirmed on justification of the procedure.
An ***operator*** will review the ISR and information added by the clinical practitioner, and performs the image acquisition procedure steps associated with the requested procedure

to create the study images. The operator may also add further information to the ISR for the attention of the reporting clinician.
A ***reporting clinician*** will review the ISR, any information added by the practitioner and operator, and the study images created. The reporting clinician may optionally create additional image objects (e.g. image reformats and presentation states) and a report. The report should capture all clinical information provided in the ISR and any additional relevant information acquired in the process of performing the procedure (e.g. complications and contrast reactions). Once the report has been authorised, the referring clinician should be notified that the procedure is complete, and the report and images made available for review.
A ***reviewing clinician***, who may be the referring clinician or another clinician involved in the patient's care, will review the report and images if required, and take any necessary action.

Throughout the imaging referral business workflow there is a clinical benefit in enabling the clinical actors to access the relevant clinical imaging history, study images and reports to:

Provide the ***referring clinician*** access to the relevant clinical information to make the referral, and to help avoid unnecessary, unsafe or duplicate referrals
Support the ***practitioner*** to justify the requested procedures on behalf of the acquiring organisation, and to help avoid unnecessary, unsafe or duplicate referrals
Assist the ***operator*** in imaging acquisition and post processing to ensure new study images are acquired using a protocol and technique comparable with previous imaging procedures
Enable the ***reporting clinician*** to compare with prior study images and reports to assess for interval change and rate of progression of disease
Support the ***reviewing clinician*** in interpreting the imaging findings and to assist in treatment planning.

Please refer to Figure 4-1 with Appendix A for a workflow diagram of the Primary Clinical Imaging Workflow.

3.1.2 Multi-site Imaging Acquisition and Reporting Workflows

The core business activities of image acquisition and reporting have been traditionally performed within the same organisation, but there are now an increasing number of strategic business drivers to support performing these activities across organisational boundaries. These drivers reflect the changing model of health service provision to support out of hours and on call reporting services, clinical network services, outsourcing of services to manage capacity and demand, and patient choice with involvement of the Independent Sector.

Multi-site imaging acquisition and reporting workflows occur when one or more imaging procedure step activities are outsourced to other organisations. **In all cases there is a lead imaging service provider that accepts an imaging referral and assumes responsibility for ensuring it is completed.**

The multi-site workflows can be split in to three main types:

1. Outsourced Image Acquisition
2. Outsourced Reporting
3. Outsourced Image Acquisition and Reporting

For each example business use case the technical options should take into consideration how each of the clinical actors can access the relevant clinical information described above, and how workflow efficiency and patient safety can be optimised through the use of worklists, study auto-routing and other system functionality.

1. **Outsourced Image Acquisition**

A ***referring clinician*** makes an Imaging Service Request to an imaging service provider. This organisation acts as the lead imaging service provider and reporting organisation, but has an arrangement to outsource the imaging acquisition procedure steps to another imaging service provider.
A ***practitioner*** at the lead imaging service provider will normally justify the request before onward referral, to avoid inappropriate referrals. The acquiring organisation will also require a practitioner to justify the procedure unless it agrees to authorise the same practitioner to act in this role.
An ***operator*** at the acquiring organisation acquires the images, which are made available back to the lead imaging service provider for reporting. The image acquiring organisation may also make the study images available to the reviewing clinician on agreement with the lead imaging service provider.
A ***reporting clinician*** at the lead imaging service provider/reporting organisation will report the studies. The referring clinician is notified when the procedure is complete, and the report and images made available for review
A ***reviewing clinician***, who may be the referring clinician or another clinician involved in the patient's care, will review the report and images if required, and take any necessary action.

Please refer to Figure 4-2 within Appendix A for a workflow diagram of Outsourced Imaging Acquisition.

Business use case examples:

A NHS trust outsources imaging acquisition to another NHS trust with spare imaging capacity, and the images made available back to the originating trust for reporting by its own radiologists.
A NHS trust outsources imaging acquisition to an Independent Sector provider to acquire images, and the images made available back to the trust for reporting by its own radiologists

2. **Outsourced Reporting**

A ***referring clinician*** makes an Imaging Service Request to an imaging service provider. This organisation acts as the lead imaging service provider and acquiring organisation, but has an arrangement to outsource the reporting procedure steps to another imaging service provider.
A ***practitioner*** at the lead imaging service provider is required to justify each requested procedure in the imaging service request
An ***operator*** at the lead imaging service provider/acquiring organisation performs the procedure steps to acquire the images. These are made available to the reporting organisation, and may be made available to the reviewing clinician.
A ***reporting clinician*** at the reporting organisation reports the studies, and the report is made available back to the lead imaging service provider. The reporting organisation may also make the report available to the reviewing clinician on agreement with the lead imaging service provider. The lead imaging service provider notifies the referring clinician that the procedure is complete, and provides a copy of the report and access to images if required.
A ***reviewing clinician,*** who may be the referring clinician or another clinician involved in the patient's care, will review the report and images if required, and take any necessary action.

Business use case examples:

Imaging acquired at a NHS trust is primarily reported by a radiologist working at another trust as a result outsourced on-call reporting service or a cross site on call rota.
Imaging acquired at a NHS trust or Primary Care Trust is primarily reported by a specialist radiologist at another NHS trust as part of a business agreement to outsource reporting of certain specialist imaging procedures
Imaging acquired at a NHS trust or Primary Care Trust is primarily reported on by independent sector radiologists
Imaging acquired at an independent sector provider is primarily reported by radiologists employed by a NHS trust.

Please refer to Figure 4-3 within Appendix A for a workflow diagram of Outsourced Reporting.

3. **Outsourced Image Acquisition and Reporting**

A ***referring clinician*** makes an Imaging Service Request to an imaging service provider. This organisation acts as the lead imaging service provider, but has an arrangement to outsource the image acquisition and reporting procedure steps to another imaging service provider.
A ***practitioner*** at the lead imaging service provider will normally justify the request before onward referral, to avoid inappropriate referrals. The acquiring organisation will also require a practitioner to justify the procedure unless it agrees to authorise the same practitioner to act in this role.
An ***operator*** at the acquiring organisation acquires the images. These may be made available back to the lead imaging service provider at this stage, or following generation of the report. The image acquiring organisation may also make the study images available to the reviewing clinician at this stage on agreement with the lead imaging service provider.
A ***reporting clinician*** at the reporting organisation reports the studies, and the report is made available back to the lead imaging service provider. The reporting organisation may also make the report available to the reviewing clinician on agreement with the lead imaging service provider. The lead imaging service provider notifies the referring clinician that the procedure is complete, and provides a copy of the report and access to images if required.
A ***reviewing clinician,*** who may be the referring clinician or another clinician involved in the patient's care, will review the report and images if required, and take any necessary action.

Please refer to Figure 4-4 within Appendix A for a workflow diagram of Outsourced Image Acquisition and Reporting.

Business use case examples:

A NHS Trust acting as the primary imaging service provider outsources selected NHS imaging procedures to another NHS Trust provider
A NHS Trust acting as the primary imaging service provider outsources selected NHS imaging procedures to an Independent Sector provider
A Primary Care Trust acting as the primary imaging service provider outsources selected NHS imaging procedures to an Independent Sector provider

3.2 Imaging Review Workflows

By definition, clinical imaging review workflows comprise all activities involved with review of an existing imaging study or studies, which are not part of a primary clinical imaging workflow.

Imaging reviews can be 3 main types

1. Informal clinical imaging review

2. Formal clinical imaging review resulting in a formal report
3. Imaging review at a multi-disciplinary team meeting

3.2.1 Informal Clinical Imaging Review

An informal clinical imaging review may be distinguished from a formal review as the clinician undertaking the review does not produce a formal clinical imaging report.

The following clinical actors are involved in this workflow:

A ***referring clinician*** requests a clinical opinion which may require review of one or more imaging studies. The referral does not require a formal imaging service request, but the relevant clinical details are communicated by another route such as by telephone or via a clinical referral letter.
A ***reviewing clinician*** will review any relevant clinical imaging history, study images and reports required to provide the clinical opinion, and take any necessary action. The reviewing clinician does not generate a formal report but may communicate the findings by another route such as by telephone or via a clinic letter.

Note a ***reviewing clinician*** has the same functional requirement to be able to review study images and reports in primary imaging and imaging review workflows, and is therefore considered to be the same actor

Following review the referring or reviewing clinician may optionally decide to convert the review to a formal imaging review to produce a formal report.

Please refer to Figure 4-5 within Appendix A for a workflow diagram of Informal Clinical Imaging Review.

Business use case examples:

An A&E clinician telephones a neurosurgical specialist to request an urgent opinion and transfer of a patient who has suffered a traumatic brain injury. The neurosurgical specialist will normally request to review the imaging findings before accepting transfer to the neurosurgical centre, and will telephone the A&E clinician after reviewing the images with a decision. Note this use case requires a quasi immediate opinion where rapid transfer and review of image data are critical.
A GP refers a patient to a secondary care clinician. The patient has had diagnostic imaging performed in a GP direct access independent sector organisation which has identified a clinical condition requiring treatment. A clinic appointment is scheduled on the trust's care record system, and the patient is listed on the clinic worklist. The specialist will need to review the imaging study some days prior to the clinic and during the consultation with the patient, and will normally comment on the imaging findings within the clinical letter sent back to the GP.

3.2.2 Formal Clinical Imaging Review

A formal clinical imaging review is a formal request for a specialist second opinion on an imaging study or studies, to produce a formal report.

The following description provides an overview of the clinical actors involved in a formal clinical imaging review referral.

A ***referring clinician*** makes an Imaging Service Request (ISR) for review of one or more existing imaging studies. The ISR will contain the original requested procedure or procedures to be reviewed and clinical information from which the Procedure Step review activities are inferred.

A ***reporting clinician*** will review the ISR, the study images and any existing reports on the study. The reporting clinician may create additional image objects (e.g. image reformats and presentation states) and a report. The report should capture all clinical information provided in the ISR and relate the report to any previous reports so that it appears logically as a follow-on report (addendum) to the preceding reports. Once the report has been authorised, the referring clinician should be notified that the review procedure is complete, and the reports and images made available for review.
A ***reviewing clinician***, who may be the referring clinician or another clinician involved in the patient's care, will review the reports and images if required, and take any necessary action. The reviewing clinician should have access to all reports and by default should be presented with the most recent report first.

Please refer to Figure 4-6 within Appendix A for a workflow diagram of Formal Clinical Imaging Review.

As with other imaging workflows, there is a clinical benefit in enabling all clinical actors to access the relevant clinical imaging history, study images and reports to:

Provide the referring clinician access to the relevant clinical information to make the referral, and help avoid unnecessary or duplicate referrals
Enable the reporting clinician to compare with prior study images and reports to assess for interval change and rate of progression of disease
Allow the reviewing clinician to validate the clinical findings and to assist in treatment planning.

Business use case examples:

A clinician requests a specialist radiologist to perform a formal review of an imaging study to confirm, clarify or refute the findings on the initial report. The study has been acquired at another organisation by an independent sector provider. The radiologist will review the studies and any relevant previous studies, and issue a formal report.

3.2.3 Imaging Review at a Multidisciplinary Team Meeting

Multidisciplinary Team Meetings (MDTM) are now a standard part of NHS diagnosis and treatment planning services, bringing together input from a number of disciplines associated with a patient's care. Review of diagnostic images is key part of most MDTM, and has specific clinical actors and workflow requirements.

A ***referring clinician*** requests review of at an MDTM which may involve review of one or more imaging studies. The referral may or may not include a formal Imaging Service Request, but the imaging specialist must be provided with sufficient clinical information to perform the review.
An ***MDTM co-ordinator*** performs an administrative process to ensure that all study images and reports relevant to the MDTM are made available on a worklist for attendees to review prior to the meeting. These studies may be drawn from a number of organisations. It must be possible to print and electronically store the list of imaging studies reviewed at MDTMs
A ***MDTM imaging lead reporting clinician***, of which there may several attending from different organisations, will review the clinical information provided and any relevant studies in advance of the meeting to form a clinical opinion. The imaging lead will normally require full reporting capabilities as they may wish to create additional reformatted images series, select key images and set a display state for presentation at the meeting. They may also perform a formal clinical imaging review as a ***reporting clinician***, creating a formal report, but this is usually only necessary if the review findings differ significantly for the preceding reports.
Other participants at the meeting act as ***reviewing clinicians***, and may benefit from access to the meeting worklist, relevant clinical imaging history, study images and reports in advance of the meeting to assist with their clinical preparation.

Please refer to Figure 4-7 within Appendix A for a workflow diagram of Imaging Review at a Multidisciplinary Team Meeting.

The relevant imaging study images and report findings are presented at the MDTM, and with clinical input from other specialities a diagnosis made/confirmed and a treatment plan agreed. The clinical output of the meeting is recorded in the patient's clinical record.

There is a requirement for PACS to link to videoconferencing systems to support display of PACS images at participant sites during the MDTM, although it cannot be assumed that all sites have videoconferencing capability so routing of image studies to the hosting MDTM organisation is still required.

4 Appendix A: Supporting Workflow Diagrams

The following appendix contains workflow diagrams associated with the clinical Imaging data sharing workflows described within section 3 of this document. The diagrams summarise the workflow with time passing from left to right. The workflow diagrams do not follow a standard form, e.g. UML Activity Diagrams, or BPMN, but future iterations of the document will do so.

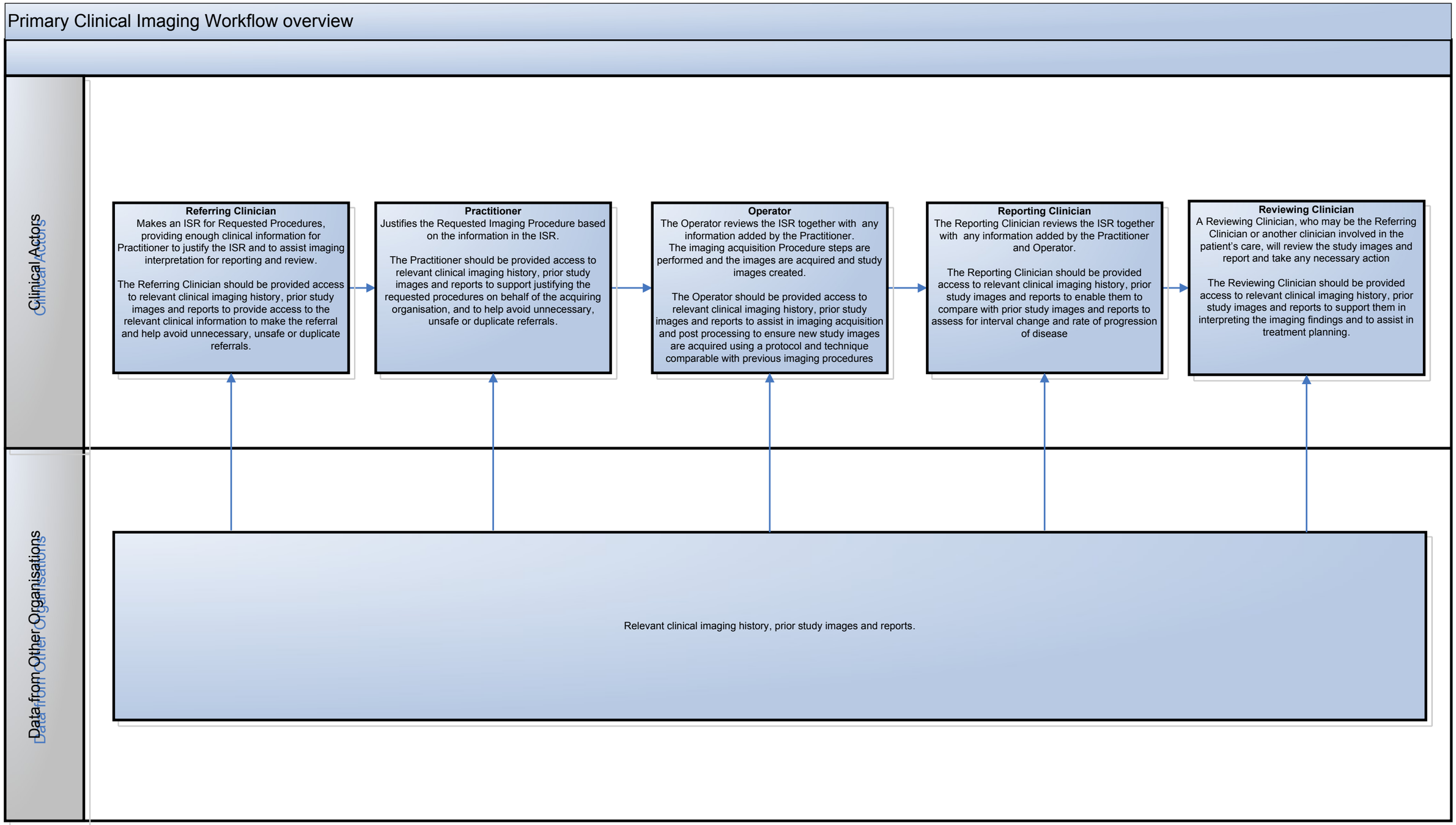

Figure 4-1: Primary Clinical Imaging Workflow Overview.

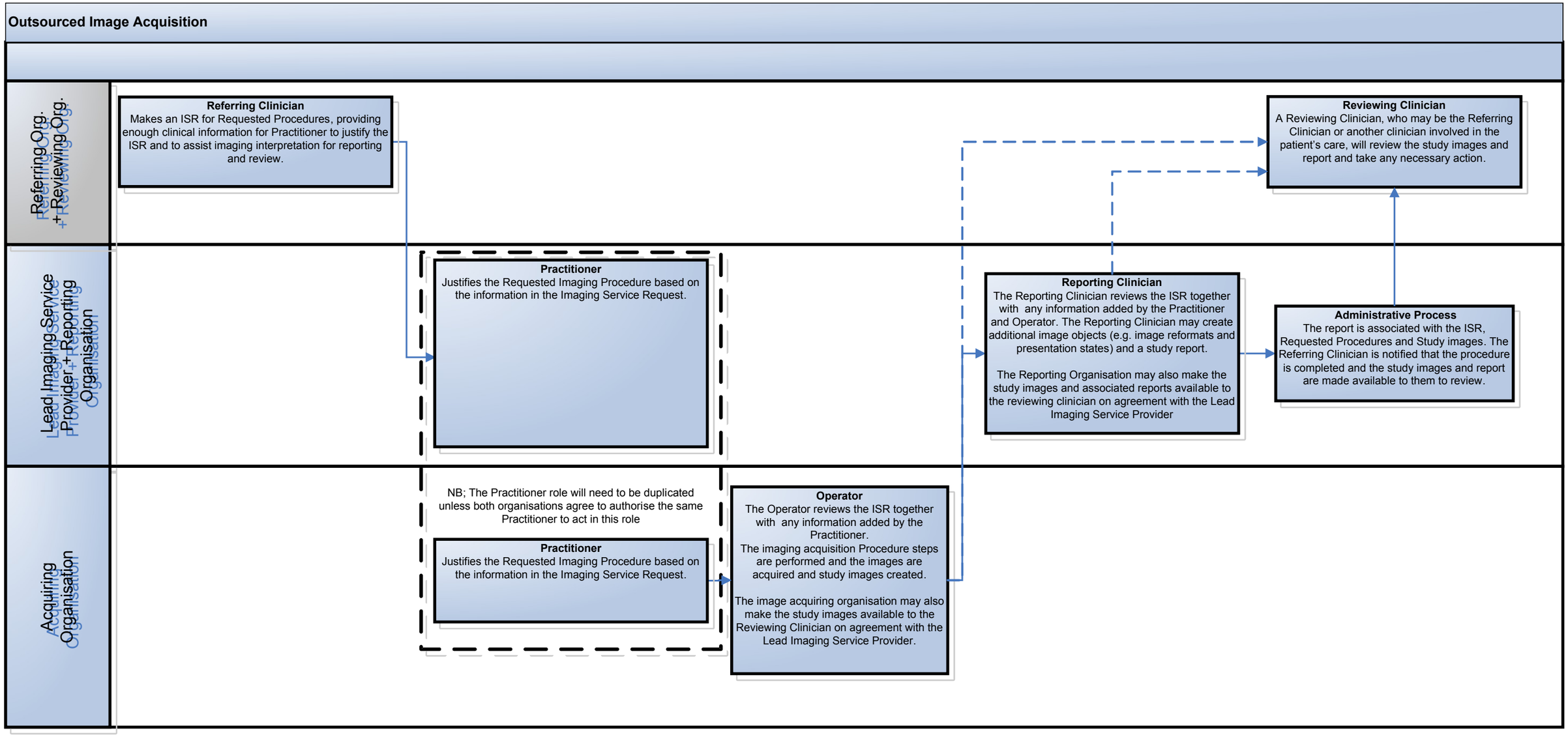

Figure 4-2 Outsourced Image Acquisition

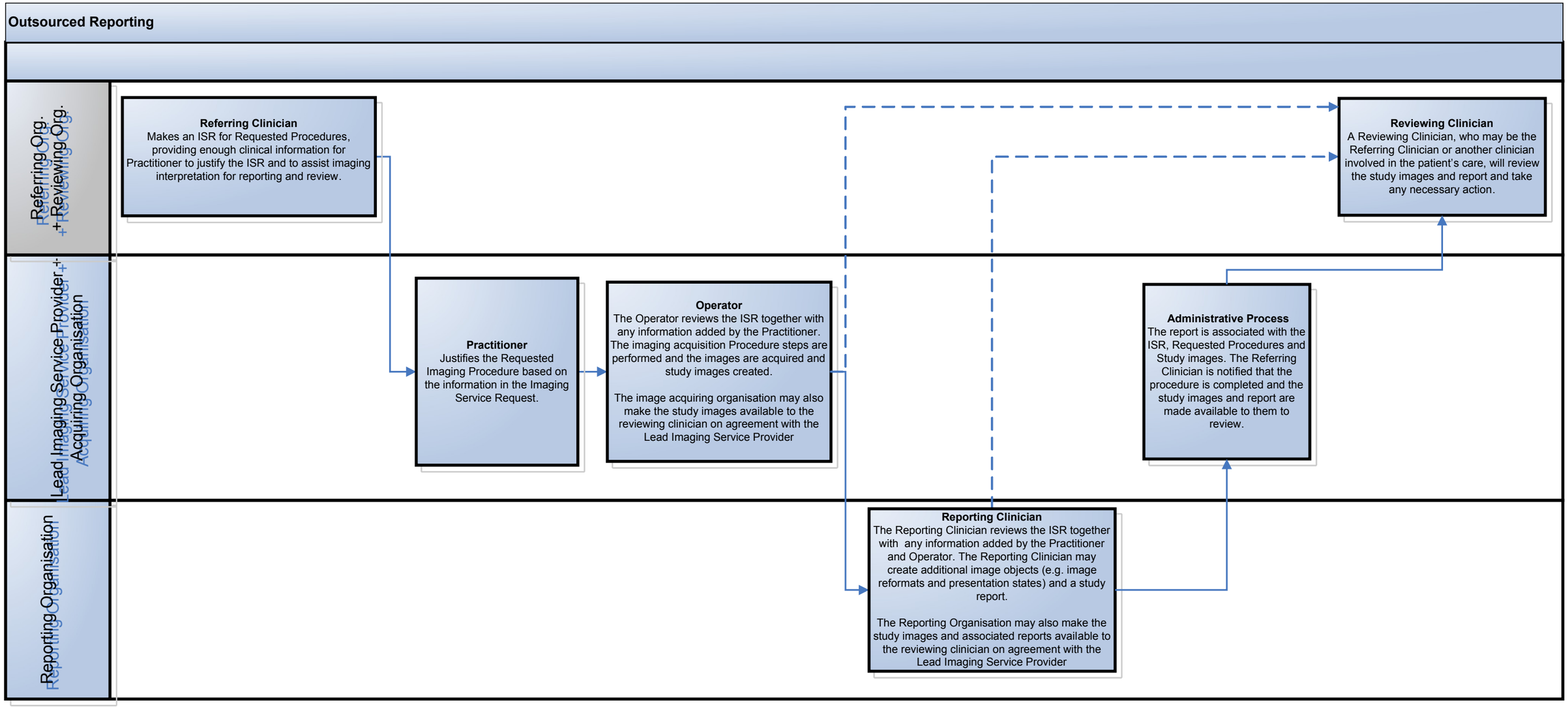

Figure 4-3: Outsourced Reporting

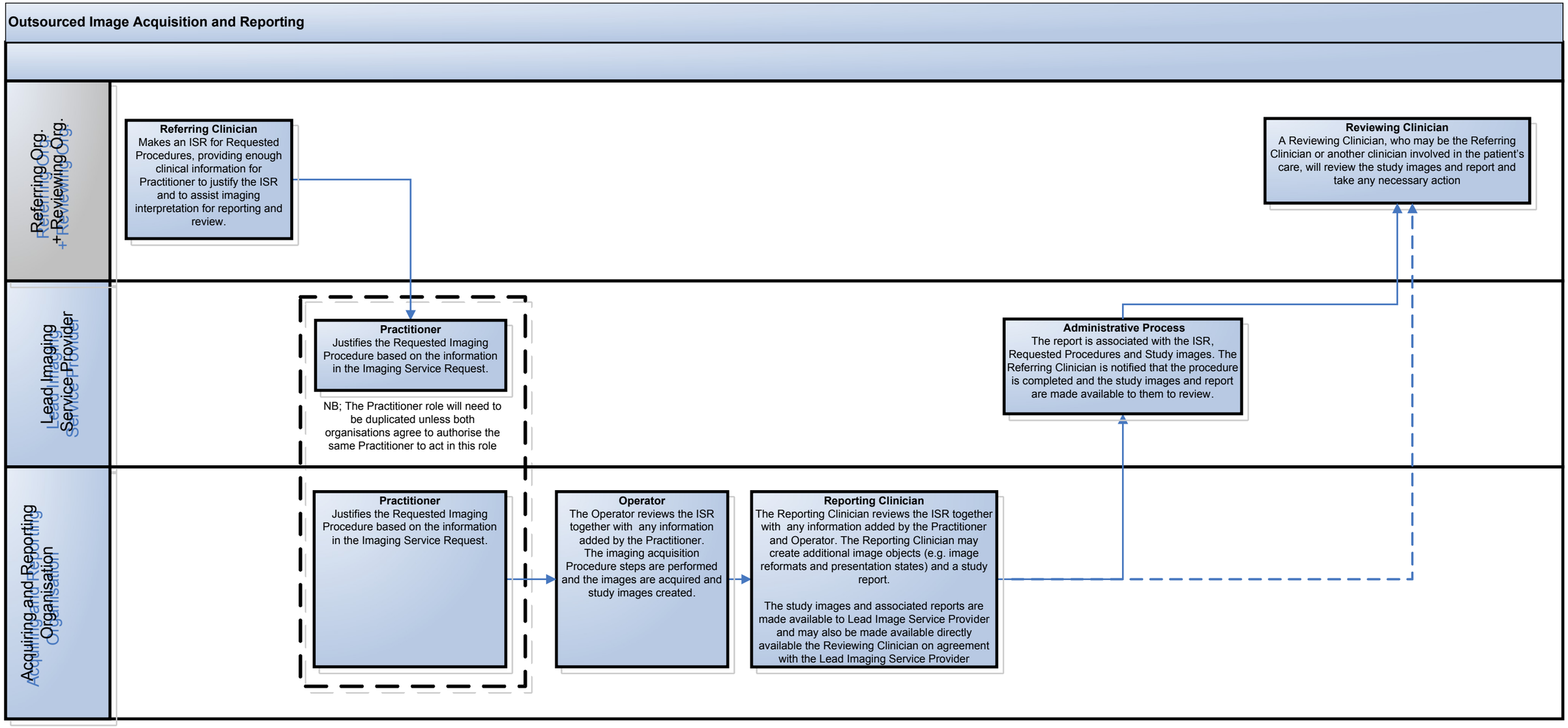

Figure 4-4: Outsourced Image Acquisition and Reporting

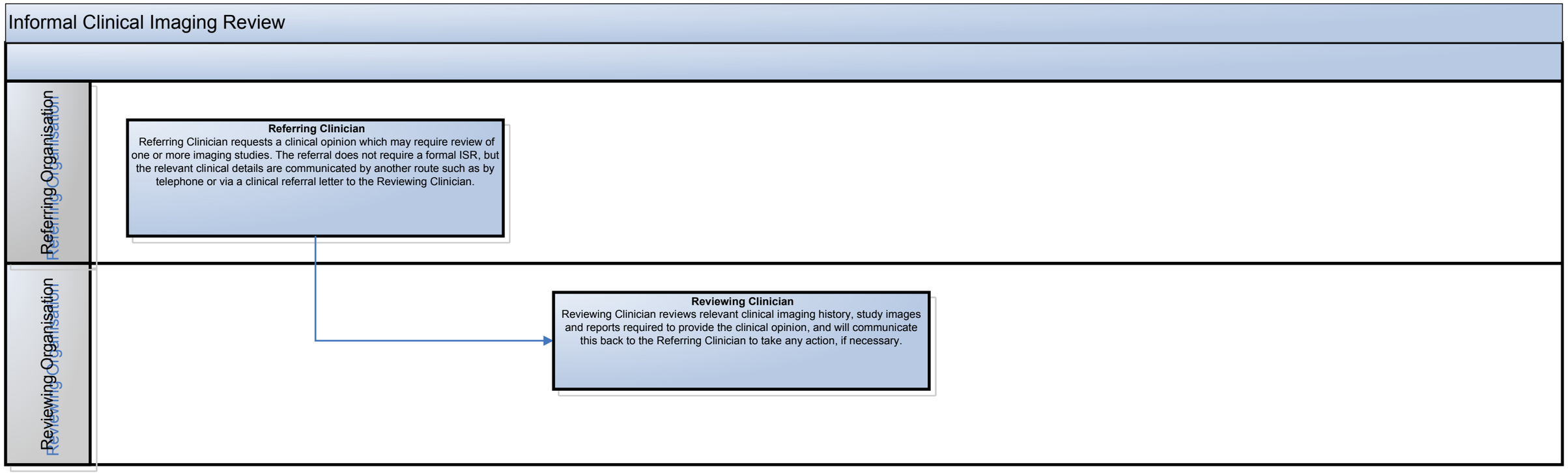

Figure 4-5: Informal Clinical Imaging Review

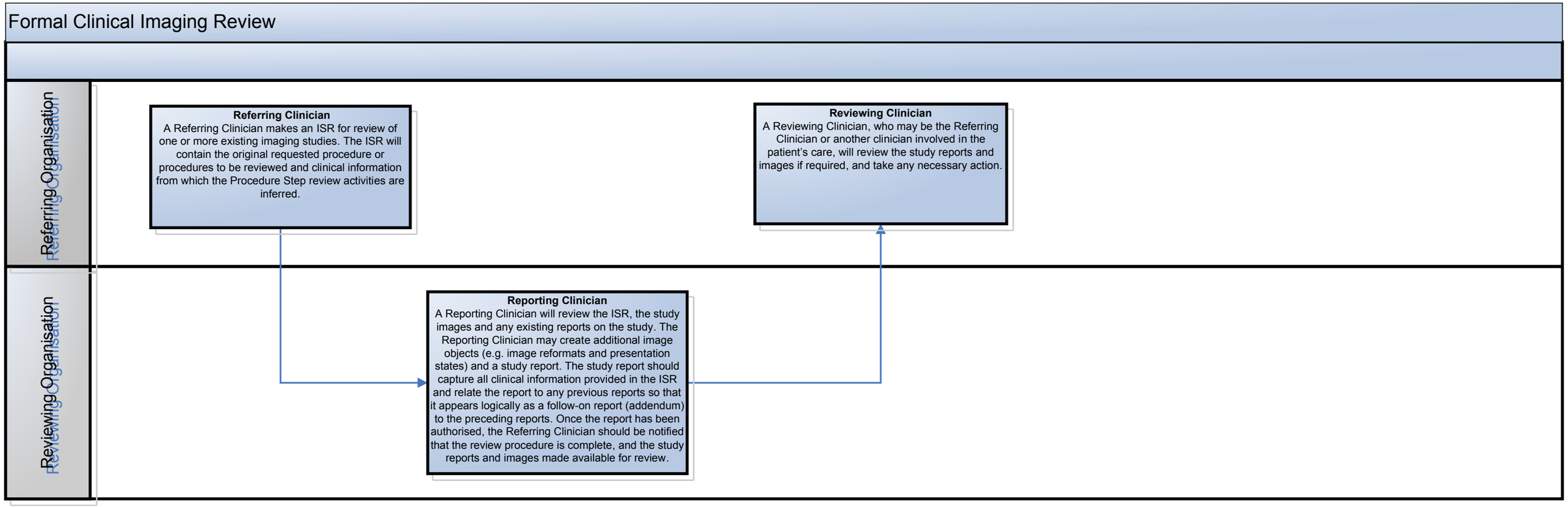

Figure 4-6 Formal Clinical Imaging Review

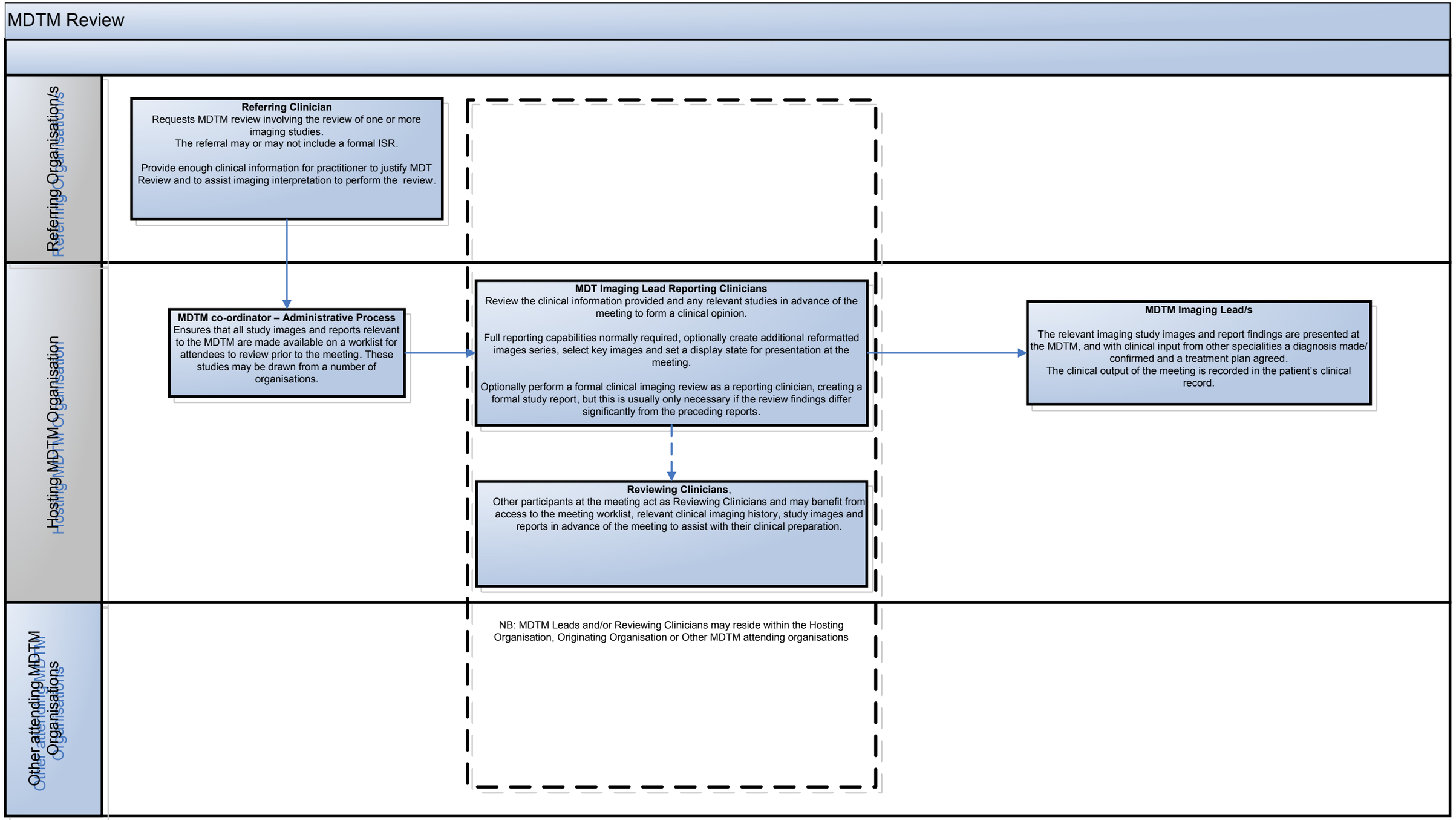

Figure 4-7: MDTM Review