

Title

Device Education in Interventional Radiology: Development of a Structured Visual Atlas

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Device Education in Interventional Radiology:

Development of a Structured Visual Atlas

Abstract

Rationale and Objectives

Interventional radiology (IR) learners must interpret device appearance and labels in relation to function, compatibility, procedural role, and distinctions among related devices. We developed a structured visual atlas for consistent device interpretation.

Materials and Methods

The first author developed the atlas in 2026 for learners beginning supervised IR training. Devices were organized by family, function, procedure, and workflow role. One physician coauthor reviewed all 171 entries for clinical and factual accuracy; the other reviewed the framework and manuscript. Each entry used three panels: visual recognition; use and procedural context; and key distinctions from related devices. Orientation sections addressed label interpretation and workflows. Technical quality assurance reconciled tracking codes, device names, section assignments, panel pages, and the assembled Standard Edition.

Results

The First Edition 2027 atlas comprised 171 entries across 18 sections. Technical quality assurance confirmed that every entry appeared in its assigned section and on its recorded panel page and that the 107-page Standard Edition rendered without missing or broken pages, unexpected blank pages, unresolved clipping, or overlap. Supplementary Material S1 illustrates the current atlas format, and Supplementary Material S2 lists all devices and their section assignments. These checks established assembly completeness, not independent clinical content validation or educational effectiveness.

Conclusion

The atlas provides a framework for device education centered on visual recognition, device-label interpretation, use and procedural context, and differentiation. Formal independent content validation and learner evaluation remain necessary.

Keywords: medical education; medical devices; visual learning; curriculum development

Introduction

Interventional radiology (IR) curricula and certification frameworks encompass device selection and use across access, navigation, delivery, therapy, and drainage, alongside procedural planning and periprocedural management (1–3). Even within a single device family, dimensions, geometry, stiffness, surface coating, tip configuration, compatibility, intended use, and procedural role may differ substantially (4–7). Accordingly, learners must do more than identify a device by name: they must interpret visual features and label specifications in relation to function, compatibility, and procedural context.

Published primers for trainees describe the appearance, properties, nomenclature, measurement systems, uses, and principles guiding selection of common needles, guidewires, catheters, and sheaths (4,5). Formal curricula likewise introduce basic device awareness and common image-guided procedures and therapies, identify procedures for learners to observe during clinical rotations, and describe clinical scenarios in which IR may be beneficial (1,2). Taken together, these resources define important educational content. Among the sources reviewed, however, we did not identify a reusable framework for organizing a broad device inventory around visual recognition, device-label interpretation, workflow role, and differentiation.

The design problem was therefore how to present visually heterogeneous devices through a consistent set of questions that learners and educators could apply across device families and procedures. At the curriculum level, the framework comprises four domains: visual recognition, device-label interpretation, use and procedural context, and differentiation (Figure 1). At the individual-entry level, the framework is applied through three recurring panels: Visual Recognition, Use & Procedural Context, and Key Distinctions. Because label interpretation and workflow pathways recur across device families, they are addressed in separate orientation sections rather than repeated within every entry.

Throughout the resource, devices are organized by family, function, procedure, and workflow role. Together, the hybrid taxonomy, recurring entry format, and orientation sections connect device appearance with function and procedural context. The atlas is an educational reference; it is not a procedural protocol, a substitute for manufacturer instructions for use, or a stand-alone guide to clinical device selection. The purpose of this work was to develop the atlas and describe its educational architecture, construction process, and procedures for verifying assembly completeness.

Materials and Methods

Development Period, Intended Learners, and Use Setting

The atlas was developed in 2026. All descriptions and technical quality-assurance checks in this report refer to *The IR Table Book, First Edition 2027*. The intended learners were medical students, postgraduate year 1 residents, diagnostic radiology residents on IR rotations, integrated IR residents early in training, and technologists and nurses new to the IR procedural setting. The atlas was designed to support preparation before a case, supervised orientation during noncritical periods of clinical learning, and review after a case, conference, or simulation. It was not designed to direct real-time device selection or procedural planning, support independent practice, or replace institutional policies, qualified supervision, or manufacturer instructions for use.

Device Inclusion and Atlas Construction

A device was eligible for inclusion if it met two criteria. First, it had a distinct, foundational table-side role in at least one representative IR workflow. Eligible roles included access, navigation, support, exchange, delivery, therapy, drainage, retrieval, closure, and securement. Second, a proposed entry for the device had to describe three elements: observable recognition features, a defined function and procedural context, and at least one meaningful distinction from a related device. Selection prioritized representative curricular coverage rather than comprehensive sampling of commercial products. Devices were excluded if they were commercial variants that added no distinct educational concept, lacked a direct table-side role, or could not be explained safely within the scope of a supervised orientation resource without step-by-step procedural instruction. Established eponyms or product-associated names were retained only when they reflected common table terminology and improved recognition; manufacturer representation and commercial prevalence did not determine inclusion.

Each device entry was assigned a unique internal tracking code used to link its primary section and final rendered page during quality assurance. Entries were assigned to one primary atlas section and organized into three recurring panels. The *Visual Recognition* panel highlighted observable features such as overall configuration, tip shape, shaft characteristics, hub design, radiopaque markers, and retention mechanisms. The *Use & Procedural Context* panel described the device's core function and representative procedural settings. The *Key Distinctions* panel emphasized differences in size, compatibility, mechanism, configuration, or procedural role relative to related devices. Separate orientation pages addressed concepts that recurred across entries, including device families, dimensions, guidewire and access-platform compatibility, working length, functional segments, labeled limits, and representative workflow pathways. Table 1 summarizes the four curriculum-level domains. Supplementary Material S1 provides representative orientation pages, index pages,

and complete device entries. Supplementary Material S2 provides a complete inventory of all 171 entries, listing each entry's internal tracking code, generic or commonly used device name, and primary section assignment.

Source Selection, Authorship, and Revision

Source selection was purposive rather than systematic and followed a defined hierarchy. National and international curricula and certification frameworks defined learner scope and competency domains. Peer-reviewed IR primers and reviews informed device categories, terminology, and task-relevant comparisons. Official device labeling, instructions for use, and manufacturer technical documents were used when device-specific dimensions, compatibility, or mechanics required confirmation. Curricula and certification frameworks governed educational scope, whereas official device documentation governed device-specific technical specifications. When sources differed, claims were limited to points of agreement; unresolved claims were omitted.

The first author, a fourth-year medical student at the time of atlas development, independently conceived and developed the atlas. This work included designing the framework, selecting devices, drafting entry text, developing the visual design, assembling the atlas, maintaining the tracking ledger, and performing technical quality assurance. After the First Edition 2027 atlas was assembled, one physician coauthor, an integrated IR resident serving as junior chief resident, reviewed all 171 entries page by page for clinical and factual accuracy. A second physician coauthor, an assistant professor with MD and PhD degrees, reviewed the framework and manuscript for clinical and educational coherence. Any issues identified during clinical review or technical quality assurance were corrected by the first author in the corresponding source files. The development process did not include duplicate independent clinical ratings, interrater reliability analysis, or a formal panel for adjudicating disagreements.

Hybrid Atlas Organization and Procedural Context

The 18-section taxonomy integrates two complementary organizational views. The first organizes entries by device family or function. Sections such as Wires, Diagnostic Catheters, and Embolics support comparison among related devices. The second organizes entries by procedure or workflow. Sections such as Central Venous Access, AV Dialysis Access, and TIPS & Portal Hypertension show how devices from multiple families converge within a clinical task.

Orientation material links the two organizational views by situating devices within a recurring six-stage functional sequence: Access, Preserve Access, Establish Platform, Reach/Position, Perform Primary Task, and Finish. It also presents two general procedural pathways, Transcatheter Vascular Intervention and Percutaneous Drainage & Tract Intervention, and four integrated workflow examples covering Central Venous Access; Image-Guided Biopsy, Ablation & Augmentation; AV

Dialysis Access; and TIPS & Portal Hypertension. The sequence is deliberately nonprescriptive; stages may be combined, repeated, or omitted according to procedural requirements.

Three-Panel Entry Architecture and Comparative Framework

Comparative design operates at both the individual-entry and section levels. Within each entry, the Key Distinctions panel compares the focal device with related devices based on differences in configuration, mechanism, compatibility, or procedural role. Section-level orientation material extends this comparative approach across commonly confused device families. Conceptual manuscript schematics illustrate the framework (Figures 1–3), whereas Supplementary Material S1 provides representative atlas pages.

Technical Quality Assurance

Technical quality assurance reconciled three representations of the atlas: the device inventory, the device-panel source document, and the assembled Standard Edition. For each of the 171 entries, the inventory listed the internal tracking code, device name, assigned section, and panel page. The first author verified that every tracking code was unique, every inventory code-name pair appeared in both the relevant section index and its device panel, and every code-name pair appeared on the recorded page in the assembled Standard Edition. All embedded media files in the device-panel source were checked for successful decoding. Any discrepancy was corrected before the affected check was repeated.

After the records were reconciled, the first author reviewed the 107-page Standard Edition page by page. The review confirmed the expected page count and order, distinguished intentional blank pages from unexpected ones, verified that every planned entry appeared in the assembled atlas, and checked for visual elements that failed to display, clipped or overlapping text and images, and unintended page breaks. Together, these stages assessed whether every planned entry appeared in the correct section and rendered panel page. These technical procedures did not assess clinical accuracy, whether learners could recognize devices from the illustrations, usability, or educational effectiveness. Clinical accuracy was reviewed separately by the physician coauthor. Because this development report included no patient or learner data, no inferential statistical analysis was performed.

Results

Structured Visual Atlas Development

The completed First Edition 2027 atlas contained 171 entries across 18 sections (Table 2; Supplementary Material S2). Section size ranged from 4 to 16 entries. Across the hybrid taxonomy, the content represented access, navigation, support, exchange, delivery, therapy, drainage, retrieval, closure, and securement roles. The complete inventory lists each entry's internal tracking code, generic or commonly used device name, and primary section assignment.

At the curriculum level, four domains organized device interpretation: Visual Recognition, Device-Label Interpretation, Use & Procedural Context, and Differentiation. At the entry level, three recurring panels applied this framework: Visual Recognition, Use & Procedural Context, and Key Distinctions. Device-label interpretation was taught in separate orientation sections and applied when relevant.

Supporting Orientation and Technical Integrity

Manual verification by the first author confirmed 171 unique internal tracking codes, all 171 inventory code-name pairs in both the section indexes and device panels, and representation of all 18 sections. All 180 embedded media files in the device-panel source decoded successfully, and the assembled Standard Edition contained every code-name pair on its recorded panel page. The IR resident coauthor completed a page-by-page clinical and factual review of all 171 entries. Page-by-page render review confirmed that all 107 Standard Edition pages were present and found no missing or broken pages, unexpected blank pages, or unresolved clipping or overlap. The technical findings establish assembly completeness only. The physician coauthor's review constituted author review rather than formal independent content validation.

Procedural Pathways and Device Differentiation

The completed orientation system included a six-stage functional sequence, two general procedural pathways, and four integrated workflow examples. Figure 2 presents three simplified workflow examples spanning vascular intervention, percutaneous access, and enteral access. These examples illustrate how different device families may fulfill the same high-level function and how procedure-specific workflows may combine, repeat, or omit stages.

Figure 3 illustrates a complementary design principle: related devices should be differentiated through focused, task-relevant comparisons rather than by appearance alone. The examples contrast diagnostic catheters with guiding catheters, sheaths with catheters, and locking pigtail drainage

catheters with Yueh needle-catheter systems based on differences in design, function, and procedural role.

Together, the pathway and comparison figures illustrate how the framework preserves device-specific detail while applying a consistent interpretive structure across sections.

Discussion

This work presents a development model for an IR device atlas rather than an effectiveness study. Its contribution is architectural: it integrates a hybrid taxonomy, standardized three-panel entries, and cross-workflow orientation. Existing curricula and primers establish the scope of device knowledge expected of learners (1–5); this framework translates that scope into repeatable interpretive questions. Specifying the edition, inclusion criteria, source hierarchy, revision process, technical checks, and complete inventory makes development traceable and distinguishes documented assembly completeness from untested outcomes.

The hybrid taxonomy addresses a tension in device education. Family-based sections facilitate comparison among related devices, whereas procedure-based sections show how devices from multiple families interact within a clinical task. A shared six-stage sequence links these views through Access, Preserve Access, Establish Platform, Reach/Position, Perform Primary Task, and Finish. Stages may be combined, repeated, or omitted as needed; the sequence does not imply a fixed path.

The three-panel design provides a consistent structure while allowing content to vary. Visual Recognition directs attention to observable cues; Use & Procedural Context connects those cues to table-side function; and Key Distinctions prompts comparison with related devices. Separate orientation sections teach label interpretation and accommodate specifications that differ among device families. This approach has not undergone usability testing.

Comparison is central because similar-appearing devices may differ in lumen size, support, compatibility, mechanism, or intended role, whereas dissimilar devices may occupy analogous workflow positions. The framework treats identification as the beginning of interpretation. This approach is consistent with competency frameworks that progress from basic wire and catheter skills to integrated device use and with certification assessment of device selection during procedural planning (3,8).

The atlas is intended as a reference-oriented complement to mentorship, simulation, physical models, and remote instruction in the IR education literature (9). Educators could assign orientation pages and selected entries before a rotation or simulation, use recurring panel questions during conference-based comparisons, and revisit entries after cases. Visual and microlearning formats may support repeated engagement with educational units (10). Internal tracking codes could support

curation of learner-specific subsets and controlled entry revisions. These applications remain prospective; feasibility, maintenance burden, and patterns of atlas use require study.

Several limitations apply. The IR resident coauthor reviewed all entries for clinical and factual accuracy, but this did not constitute independent validation or generate duplicate ratings or interrater reliability data. Manual technical quality assurance assessed file linkage and page assembly only. The atlas has not undergone systematic testing of illustration recognizability, usability assessment with educators or learners, or evaluation of educational outcomes. Device selection and organization reflected one developer's judgment and a purposive rather than systematic source review; coverage may therefore differ across institutions, learner groups, and practice settings. The resource is representative rather than exhaustive, requires continued updates as technology evolves, and cannot replace device-specific instructions or supervised procedural training.

The planned evaluation sequence will begin with independent expert content review using documented adjudication, followed by testing of illustration recognizability and usability. A prospective cohort study is planned to compare learners' device fluency before and after an IR rotation across visual recognition, label interpretation, procedural-context reasoning, and device differentiation, while assessing feasibility and patterns of atlas use. Because changes during a clinical rotation may also reflect concurrent learning, attributing educational effects to the atlas will require an appropriate comparison strategy. This sequence is intended to evaluate outcomes beyond the present development study.

Despite these limitations, the 107-page Standard Edition shows that a heterogeneous inventory of 171 entries can be organized across 18 sections within a coherent instructional architecture. The framework provides a basis for independent expert validation and pilot testing, which are necessary before claims of content validity, usability, or educational effectiveness can be made.

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Table Legends

Table 1. Curriculum-Level Domains Supporting Interventional Radiology Device Interpretation.

Four curriculum-wide domains inform use of the atlas. Individual device entries use three recurring panels: Visual Recognition, Use & Procedural Context, and Key Distinctions. Device-label interpretation is taught in separate orientation material and applied across entries when relevant.

Table 2. Atlas Sections and Entry Counts. The First Edition 2027 atlas contains 171 entries across 18 sections. These counts describe the assembled educational resource and do not constitute a sampling frame, a clinical validation result, or a measure of educational effectiveness.

Figure Legends

Figure 1. Curriculum-level framework for IR device interpretation. The sequence begins with device-family identification and integrates the atlas's three recurring panels: Visual Recognition, Use & Procedural Context, and Key Distinctions. Device-label interpretation is taught separately. The figure is a conceptual synthesis of the atlas orientation rather than the layout of an individual entry. Abbreviations: cm, centimeters; F, French; IR, interventional radiology; vs., versus. Symbol: ", inches.

Figure 2. Simplified schematic of recurring device functions across selected IR workflows. The atlas itself presents a six-stage functional sequence and detailed workflow examples; individual procedures may combine, repeat, or omit stages. Abbreviation: IR, interventional radiology.

Figure 3. Illustrative device-differentiation comparisons. The schematic uses focused, task-relevant comparisons aligned with selected atlas device families and is not a reproduction of specific atlas entries. Abbreviation: VS, versus.

Supplementary Material

Supplementary Material S1. Representative Atlas Sampler. Selected orientation, index, and completed device-panel pages demonstrate the atlas's organization and recurring educational architecture.

Supplementary Material S2. Complete Atlas Entry Inventory. The inventory lists each entry's internal tracking code, generic or commonly used device name, and primary section assignment.

Table 1. Curriculum-Level Domains Supporting Interventional Radiology Device

Interpretation

Four curriculum-wide domains inform use of the atlas. Individual device entries use three recurring panels: Visual Recognition, Use & Procedural Context, and Key Distinctions.

Device-label interpretation is taught in separate orientation material and applied across entries when relevant.

Domain	Key Question	Representative Considerations
Visual Recognition	How is the device identified?	Device family, overall configuration, tip shape, shaft characteristics, hubs/connectors, radiopaque markers, retention features
Device-Label Interpretation	How should label information be interpreted?	Device family; treatment dimensions; wire and access-platform compatibility; working length; functional segment; labeled limits; and other device-specific information taught in the label-reading orientation
Use & Procedural Context	What does the device do, and where will the learner see it?	Core function, common procedural settings, and position within a representative sequence
Key Distinctions	What most clearly distinguishes it from related devices?	Sizing, compatibility, mechanism, configuration, recognition features, intended function, and procedural role

Table 2. Atlas Sections and Entry Counts

The First Edition 2027 atlas contains 171 entries across 18 sections. Counts describe the assembled educational resource and do not represent a sampling frame, clinical-validation result, or measure of educational effectiveness.

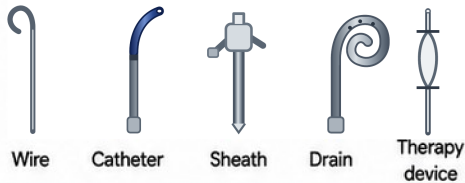
Atlas Section	Entry Count
Access	9
Wires	9
Sheaths & Dilators	7
Diagnostic Catheters	16
Microcatheters, Microwires & Crossing Systems	6
Contrast & Table Setup	9
Embolics	13
Balloons	9
Stents & Stent Grafts	8
Thrombectomy & Lysis	7
Embolic Protection, Retrieval & IVC Filters	7
Drains & Enteral Access	9
Biliary & Genitourinary	16
Central Venous Access	9
Image-Guided Biopsy, Ablation & Augmentation	12
AV Dialysis Access	5
TIPS & Portal Hypertension	4
Closure, Hemostasis & Securement	16
Total	171

A structured framework integrating device recognition, label interpretation, procedural context, and differentiation.



Device encountered
during procedural practice

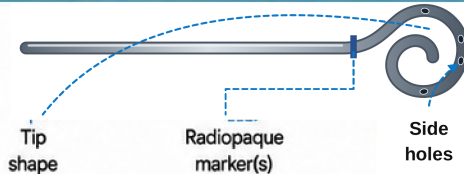
1



Device Family Recognition
What type of device is this?

Identify the broad device family before interpreting technical details.

2



Visual Recognition
What features identify it?

Use visual cues to identify key features and structural characteristics.

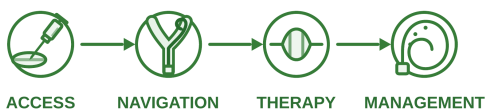
3



Device-Label Interpretation
How do specifications communicate function?

Interpret label information to understand dimensions, compatibility, and functionality.

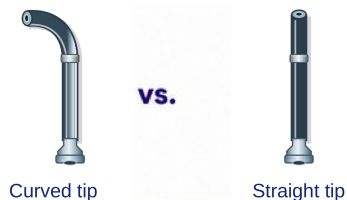
4



Workflow Context
Where does this device fit in the procedure?

Place the device within the procedural sequence and understand its role.

5



Device Differentiation
How is it different from related devices?

Distinguish this device from related options using differences in design, function, and procedural role.



Integrated Device Interpretation Framework

Recognition + Device-Label Interpretation + Use & Procedural Context + Differentiation

Illustrative simplified pathways; individual procedures may combine or omit stages.

DEVICE MEANING EMERGES FROM:



FUNCTION
What it does

+



WORKFLOW ROLE
Where it fits

+



PROCEDURAL CONTEXT
Why it is used



VASCULAR INTERVENTION
Access → Navigation → Therapy



PERCUTANEOUS ACCESS
Target Access → Sampling/Drainage → Management



ENTERAL ACCESS
Access → Placement → Use & Management

1

ACCESS

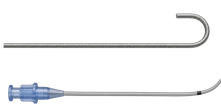


Needle / Sheath
Establish safe
vascular entry



2

NAVIGATION

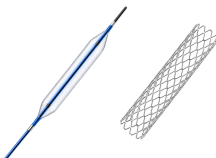


Guidewire / Catheter
Navigate to
the target



3

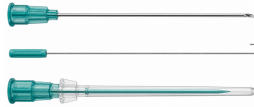
THERAPY



Balloon / Stent
Deliver therapy
at the target

1

TARGET ACCESS



Needle / Access Set
Reach the target
under imaging
guidance



2

SAMPLING OR DRAINAGE

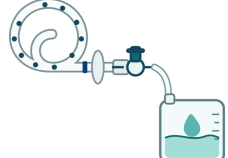


**Biopsy Device /
Drain Catheter**
Obtain tissue or
establish
drainage



3

MANAGEMENT



**Drainage Catheter
System**
Maintain therapeutic
access and output

1

ACCESS



Needle / Access Set
Create controlled
enteral access



2

PLACEMENT



**Dilator / Catheter /
Tube**
Establish and
secure the
access route



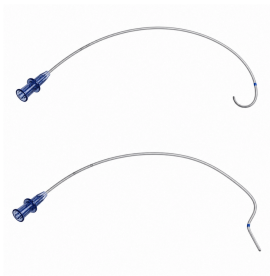
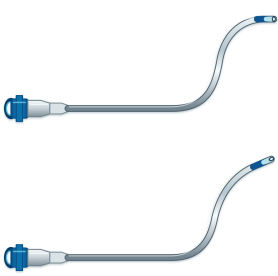
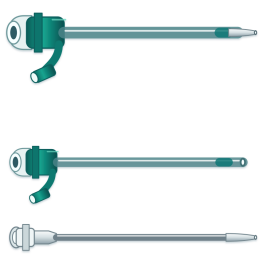
3

USE & MANAGEMENT



**Feeding or
decompression tube**
Supports feeding,
hydration, medication
delivery, or decompression.

Related devices may differ in design, function, and procedural role.

1 DIAGNOSTIC CATHETER VS GUIDING CATHETER  PRIMARY ROLE Branch selection, wire direction, and contrast injection RECOGNITION CUES - Shaped distal geometry - Often smaller lumen or profile - Tailored to selective work KEY DISTINCTION May provide support, but its primary emphasis is selective work and contrast injection.  PRIMARY ROLE Proximal support and interventional device delivery RECOGNITION CUES - Often larger lumen - Supportive shaft - Designed for device delivery KEY DISTINCTION Provides greater lumen capacity and proximal support than a routine diagnostic catheter.
2 SHEATH VS CATHETER  PRIMARY ROLE Establish and preserve a working access pathway RECOGNITION CUES - Tubular working conduit - Valve or sidearm, when present - Often paired with a dilator KEY DISTINCTION Maintains the working conduit through which other devices are introduced.  PRIMARY ROLE Perform a device-specific task within the access pathway RECOGNITION CUES - Flexible or shaped shaft - Device-specific distal geometry - May image, support, drain, or treat KEY DISTINCTION Role depends on design, configuration, and intended use.
3 LOCKING PIGTAIL DRAINAGE CATHETER VS YUEH NEEDLE-CATHETER SYSTEM  PRIMARY ROLE Maintain drainage from a collection or cavity RECOGNITION CUES - Distal pigtail with side holes - Locking hub or retention string KEY DISTINCTION Retention loop and side holes support ongoing drainage.  PRIMARY ROLE Establish access for aspiration or drainage RECOGNITION CUES - Needle within flexible catheter - No locking pigtail KEY DISTINCTION Maintains access after puncture; not an indwelling locking drainage catheter.



KEY PRINCIPLE:

Device interpretation integrates recognition cues with intended function and procedural role.

SUPPLEMENTARY MATERIAL S1

Representative Atlas Sampler

Device Education in Interventional Radiology: Development of a Structured Visual Atlas

This sampler reproduces selected pages from the First Edition 2027 atlas to demonstrate its organization and recurring page architecture. The selection includes global and section-level indexes; orientation pages addressing the three-panel lens, device-label interpretation, and functional pathways; and completed device-panel pages spanning vascular and nonvascular domains. Each device entry integrates Visual Recognition, Use & Procedural Context, and Key Distinctions. The complete atlas contains 171 device entries across 18 sections.

Sampler sequence

- Atlas scope and organization
- Global and section-level orientation
- Representative section index
- Completed device-panel pages across six clinical domains

Abbreviations used in reproduced pages: BRTO, balloon-occluded retrograde transvenous obliteration; F/Fr, French; FNA, fine-needle aspiration; GU, genitourinary; IFU, instructions for use; IR, interventional radiology; and TIPS, transjugular intrahepatic portosystemic shunt.

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Device Category Taxonomy

The taxonomy is organized primarily by device family and table function, with selected anatomy-specific or workflow-specific sections used when devices are most meaningfully learned in clinical context. Each device is placed where its recognition, functional role, and procedural context are most useful to the learner; cross-references may be used when a device spans more than one domain.

NO.	CATEGORY	EDUCATIONAL FOCUS
01	Access	Entry needles, blades, access kits, and basic instruments used to establish controlled access to vessels, ducts, collections, and soft tissues.
02	Wires	Access, exchange, support, navigation, and microwire platforms that guide device movement and help maintain procedural position.
03	Sheaths & Dilators	Introducer sheaths, guiding sheaths, peel-away sheaths, valves, dilators, and support systems used to maintain access and deliver devices.
04	Diagnostic Catheters	Simple-angle, visceral, arch-selective, reverse-curve, and flush catheters used to navigate anatomy, direct wires, inject contrast, and define vascular or luminal targets.
05	Microcatheters, Microwires & Crossing Systems	Low-profile catheter, microwire, support, crossing, and re-entry systems used for superselective navigation, distal access, lesion crossing, embolic delivery, and fine procedural control.
06	Contrast & Table Setup	Contrast delivery, flush, stopcock, manifold, pressure, connector, and injector components that organize table workflow, maintain line control, and support imaging.
07	Embolics	Coils, plugs, particles, microspheres, liquid embolics, sclerosants, radioembolic agents, and temporary materials used for targeted occlusion, flow modification, or therapy delivery.
08	Balloons	Angioplasty, occlusion, cutting, drug-coated, lithotripsy, and compliant balloon systems, plus related inflation and plaque-modification tools, used for dilation, flow control, lesion preparation, or device molding.
09	Stents & Stent Grafts	Bare, covered, drug-eluting, peripheral, venous, biliary, portal, and enteral stent platforms used to scaffold, seal, exclude, or maintain luminal patency.
10	Thrombectomy & Lysis	Aspiration, mechanical thrombectomy, rheolytic, and lytic-delivery systems used to remove, disrupt, aspirate, or dissolve thrombus.
11	Embolic Protection, Retrieval & IVC Filters	Distal embolic-protection filters, snares, baskets, forceps, IVC filters, delivery systems, and retrieval sheaths used for intraprocedural embolic protection, foreign-body capture, IVC filter placement, and filter retrieval.
12	Drains & Enteral Access	Drainage catheters, locking pigtailed, pleural and peritoneal drainage systems, gastrostomy and gastrojejunostomy devices, gastropexy anchors, and collection accessories used for fluid evacuation or enteral access.
13	Biliary & Genitourinary	Biliary, gallbladder, renal, ureteral, and bladder access, drainage, dilation, stenting, exchange, and tract-management systems used across hepatobiliary and urinary interventions.
14	Central Venous Access	PICC, midline, non-tunneled and tunneled central catheters, dialysis catheters, implanted ports, and related access components used for durable or temporary venous access.
15	Image-Guided Biopsy, Ablation & Augmentation	Coaxial introducers, core and aspiration needles, transjugular and bone biopsy systems, fiducial markers, ablation probes, protective adjuncts, and vertebral augmentation platforms used for image-guided tissue diagnosis, targeting, ablation, and fracture stabilization.
16	AV Dialysis Access	Fistulography, angioplasty, thrombectomy, stent-graft, and circuit-management tools used to evaluate, maintain, or salvage arteriovenous fistulas and grafts.
17	TIPS & Portal Hypertension	Portal access, pressure measurement, TIPS creation and revision, variceal embolization or obliteration, tamponade, and reconstruction tools used in portal hypertensive intervention.
18	Closure, Hemostasis & Securement	Compression, suture-mediated, plug-based, topical hemostatic, suturing, securement, dressing, cap, and connection supplies used to complete access sites, control bleeding, secure indwelling devices, and protect procedural sites.

ORIENTATION PAGES

How to Use This Book During an IR Rotation

Orientation purpose: Use this manual to build visual and functional fluency at the IR table. The book contains 171 curated device entries organized across 18 sections. The goal is to recognize device families, understand the procedural role and context of each tool, and distinguish visually or functionally similar devices without treating the book as a procedural protocol, instructions for use (IFU), or independent device-selection guide.

Use the Three-Panel Lens

Panel	Question to answer	How to use it
VISUAL RECOGNITION	What am I looking at?	Identify the physical cues that distinguish the device on the table or in its packaging.
USE & PROCEDURAL CONTEXT	What does it do, and where will I see it?	Connect the device to its core function and the kinds of cases in which it commonly appears.
KEY DISTINCTIONS	What most clearly distinguishes it from similar devices?	Focus on the sizing, compatibility, mechanism, configuration, or recognition feature that separates it from similar tools.

Case-Based Use

Case phase	Learner task
Before the case	Review the relevant section orientation page and a small number of likely device panels. Anticipate device families rather than individual brands.
At the table	Identify the device family first, then the specific device. Ask what role it is playing now: access, navigation, support, exchange, delivery, treatment, drainage, retrieval, closure, or securement.
During the case	Follow the sequence of device functions. Notice when access is preserved, when the platform changes, and when a device is exchanged for a more supportive or more specialized system.
After the case	Revisit unfamiliar devices while the sequence is still fresh. Compare them with the nearest look-alike entry and connect each one to the stage where it appeared.

Common Table Language

What you may hear	Learner translation
“Get access.”	Create controlled entry into the target vessel, duct, collection, organ, or space.
“Hold the wire.”	Maintain wire position so the pathway is not lost while another device is removed, exchanged, or advanced.
“Upsize.”	Exchange to a larger-caliber or more supportive access platform because the next device requires it.
“Select it.” / “Superselect.”	Use catheter and guidewire geometry to enter the intended branch; superselection implies a smaller, more distal, or more selective target.
“Do a run.”	Inject contrast and acquire an angiographic or fluoroscopic run to assess anatomy, flow, device position, or treatment effect.
“Deploy it.”	Release an implant or occlusion device such as a coil, plug, stent, filter, or closure system.
Guardrails	Use the book for orientation, not procedural instruction. Follow supervising clinicians, institutional policy, and device-specific instructions for use (IFU). Do not infer interchangeability from appearance. Similar-looking devices may differ in size, platform, compatibility, mechanism, or intended use. Do not consult the book during critical procedural moments. Review before or after the case, when doing so will not distract from the immediate responsibilities of the procedural team.

ORIENTATION PAGES

How to Read IR Device Labels

Orientation purpose: Device labels combine several measurement systems with compatibility, delivery, and safety information. Read the package as a system: identify the device family, decode the dimensions, confirm the wire and access platform, then check working length, functional segment, and labeled limits.

Device Label Decoder

Label cue	What it usually means	Why it matters
Device name and family	Generic device class and, when applicable, a proprietary product name.	Confirms what you are reading before interpreting size or compatibility.
French (Fr / F)	Nominal outer diameter for many catheters, sheaths, drains, and lines; 1 Fr corresponds to approximately 0.33 mm.	Larger French number generally means a larger-profile device; exact compatibility remains device-specific.
Gauge (G)	Needle gauge.	Higher gauge number corresponds to a smaller needle diameter.
0.035, 0.018, or 0.014 in	Guidewire diameter in inches.	Defines the wire platform with which the device is designed to work.
Millimeter (mm)	Commonly treatment diameter and working length for balloons, stents, and other therapeutic devices.	Describes the treatment segment rather than overall catheter length.
Centimeter (cm)	Overall or working length of a guidewire, catheter, sheath, probe, or delivery system.	Determines reach and whether an exchange can be completed while position is maintained.
Sheath or guide requirement	Minimum delivery or access platform listed by the manufacturer.	Confirms whether the current access system can accept and deliver the device.
Functional segment	Side-hole zone, infusion length, balloon length, covered segment, active tip, or treatment zone.	Identifies the portion that actually performs the intended task.
Labeled limits	Pressure rating, solvent compatibility, power-injection status, MR safety information, sterility, lot number, and expiration date.	Prevents use outside stated device constraints and preserves traceability.

Interpret the Numbers in Context

Example	How to read it
"6F × 55 cm sheath"	6F is the labeled sheath size; 55 cm is the shaft length.
"0.035 in compatible"	The device is intended to work on a 0.035-inch guidewire platform.
"6 mm × 40 mm balloon"	6 mm is the balloon diameter; 40 mm is the balloon working length.
"Requires 7F sheath"	The delivery system needs an access platform that meets the labeled requirement; this does not describe target-vessel diameter.
Read in Order	1. Device family. What is the system? 2. Treatment dimensions. What part of the device is being sized? 3. Wire platform. What guidewire is required? 4. Access requirement. What sheath or guide is required? 5. Length and functional segment. Can it reach, and where does it work? 6. Special limits. What pressure, solvent, sterility, or device-specific restrictions apply?
Do Not Confuse	Sizing systems are not interchangeable. Larger French numbers indicate larger nominal device size, while higher gauge numbers indicate smaller needles. Trademark status is not a device category. A proprietary product name may identify a specific implementation of a broader generic device family. Appearance is not compatibility. Use manufacturer-labeled wire, sheath, pressure, and material requirements rather than inferring compatibility from visual similarity.

ORIENTATION PAGES

Common IR Device Pathways

Orientation purpose: There is no universal procedural sequence, but most IR cases can be understood by following recurring device functions. Use the framework below to orient yourself to what has already been accomplished, what must be preserved, and what the next device is expected to do.

Universal Functional Sequence

1. Access	2. Preserve Access	3. Establish Platform	4. Reach / Position	5. Perform Primary Task	6. Finish
Create controlled entry into the target.	Maintain a safe pathway during exchanges.	Build the working access needed for the case.	Navigate or position the working device at the target.	Image, sample, drain, retrieve, reconstruct, or treat.	Confirm the endpoint, remove or secure devices, and complete the site.

Transcatheter Vascular Intervention

Stage	Typical devices	What the learner should notice
Access	Access needle; micropuncture set; vascular introducer sheath	How the vessel is entered and what establishes the first stable working platform.
Navigation	0.035-inch guidewire; diagnostic catheter; guiding catheter	How wire behavior and catheter geometry move the system from access site to target.
Distal and crossing work	Microguidewire; coaxial or torqueable microcatheter; crossing support catheter	When the system becomes smaller, more distal, or more supportive.
Primary therapy	Embollic; balloon; stent or stent-graft; thrombectomy or retrieval device	Which mechanism is accomplishing the therapeutic objective.
Completion	Completion angiography or endpoint assessment; closure, hemostasis, or compression	How the operator confirms the result and completes the access site.

Percutaneous Drainage & Tract Intervention

Stage	Typical devices	What the learner should notice
Target access	Chiba needle; spinal needle; Yueh system; trocar drainage system	Whether access is fine-needle, wire-guided, needle-over-catheter, or direct trocar.
Pathway control	0.018- or 0.035-inch guidewire; coaxial transitional access set	What preserves access while the tract is prepared or the device is exchanged.
Tract preparation	Serial tract dilators; sheath	How the tract is enlarged or stabilized for the definitive catheter.
Definitive device	Drainage catheter; percutaneous nephrostomy catheter; biliary drainage catheter; enteral tube	What remains in the patient and where its functional segment must sit.
External configuration and securement	Connector, cap, securement device, dressing, or drainage setup	How the indwelling device is made usable and protected after placement.
Key Principle	Follow function before specific device name. A device may perform more than one stage, and some procedures skip stages entirely. The most useful question is: what job must be accomplished next?	

ORIENTATION PAGES

Biliary & Genitourinary

Orientation purpose: Biliary and genitourinary interventions are grouped because both rely on recurring percutaneous device concepts: fine access, wire preservation, tract preparation, internal or external drainage, exchange, dilation, stenting, and catheter positioning across an obstruction. Learn the shared device logic while keeping the anatomy and endpoints distinct.

Key Principle

The shared question is: where does the catheter or stent begin, what segment does it cross, and where does it terminate? That determines whether the system is external, internal-external, or fully internal.

Shared Percutaneous Framework

Stage	Biliary examples	Genitourinary examples
Access and transition	Coaxial transitional access set; biliary access sheath	Coaxial transitional access set; ureteral access catheter
Drainage	External biliary drainage catheter; internal-external biliary drainage catheter; percutaneous cholecystostomy catheter	Percutaneous nephrostomy catheter; nephroureteral catheter; suprapubic cystostomy catheter
Dilation and diagnostic work	Biliary angioplasty balloon catheter; biliary occlusion balloon catheter; biliary cytology brush; biliary stone retrieval basket	Ureteral access catheter and guidewire platform may support crossing, opacification, or exchange
Internal stenting	Covered or uncovered self-expanding metal biliary stent	Double-J ureteral stent

High-Yield Distinctions

Pair	What separates them
External biliary drain vs internal-external biliary drain	External drainage terminates above the obstruction and exits to the skin; internal-external drainage crosses the obstruction and extends into bowel while preserving external access.
Nephrostomy vs nephroureteral catheter	A nephrostomy drains the collecting system externally; a nephroureteral catheter traverses the ureter and extends toward or into the bladder.
Double-J stent vs nephroureteral catheter	A Double-J stent is entirely internal with curls in the renal pelvis and bladder; a nephroureteral catheter retains an external component.
Covered vs uncovered biliary stent	Covered stents add a lining that can resist tissue ingrowth or seal a leak; uncovered stents preserve open mesh across side branches.
Biliary occlusion balloon vs angioplasty balloon	The occlusion balloon temporarily blocks flow for imaging or control; the angioplasty balloon dilates a narrowed duct or tract.
Learner Focus	Trace the catheter or stent course. Follow the pathway from skin entry through the organ or ductal system, across any obstruction, to the final catheter or stent endpoint. Identify what remains external. A skin exit, drainage limb, cap, or bag changes how the device functions after the procedure. Do not collapse biliary and GU anatomy into one category. They share device logic, but their anatomy, device configuration, and treatment endpoints remain distinct.

13. BILIARY & GENITOURINARY



Device Index

CHAPTER 13

Ductal and collecting-system intervention

13-01 Biliary access sheath

13-02 Biliary angioplasty balloon catheter

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13-04 Biliary occlusion balloon catheter

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13-11 Nephroureteral catheter

13-12 Percutaneous cholecystostomy catheter

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13-14 Suprapubic cystostomy catheter

13-15 Uncovered self-expanding metal biliary stent

13-16 Ureteral access catheter

13

BILIARY & GENITOURINARY

RECOGNIZE • CONTEXTUALIZE • DISTINGUISH

1. ACCESS

01-05 Micropuncture set

Access transition set



VISUAL RECOGNITION

Tray containing a fine 21-gauge needle, 0.018-inch guidewire, coaxial dilator, and small sheath; exact components vary by kit.

USE & PROCEDURAL CONTEXT

Bundled kit that uses a fine 21-gauge needle and 0.018-inch wire to establish access before transitioning to a 0.035- or 0.038-inch working guidewire and compatible sheath. Typical contexts include vascular access, ports, dialysis catheters, fistulograms, nephrostomy, and biliary drainage.

KEY DISTINCTIONS

The micropuncture set is a complete transition pathway rather than a single access device, combining the 21-gauge needle, 0.018-inch guidewire, transitional dilator, and small sheath needed to reach a larger working platform.

01-06 No. 11 scalpel blade

Skin-nick blade



VISUAL RECOGNITION

Small, pointed triangular No. 11 blade with a straight cutting edge; typically mounted on a handle for a controlled skin nick.

USE & PROCEDURAL CONTEXT

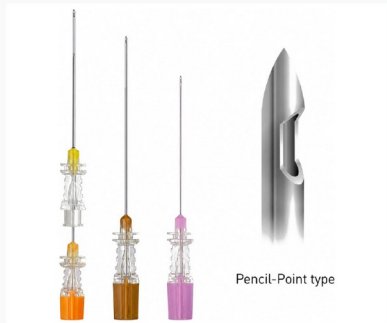
Creates a small skin nick at the access site to facilitate passage of a sheath, drain, catheter, or tunneler after wire access. Typical contexts include percutaneous procedures requiring a larger access device.

KEY DISTINCTIONS

The No. 11 blade enlarges the superficial skin entry only; it is used after access is secured and should not be confused with the needle that establishes target entry.

01-07 Spinal needle

Long stylet needle



Pencil-Point type

VISUAL RECOGNITION

Long, thin needle with a matched removable stylet and either a cutting bevel or pencil-point tip, depending on design; typically much longer than a short access needle.

USE & PROCEDURAL CONTEXT

Long stylet needle for reaching deep or neuraxial targets and delivering anesthetic or contrast through a narrow path. Typical contexts include lumbar puncture, myelography, neuraxial anesthesia, MSK and arthrogram injections, pain procedures, and CT-guided deep access.

KEY DISTINCTIONS

Its long, narrow, styletied shaft reaches deep or neuraxial targets; tip geometry may be pencil-point or cutting, depending on the intended use.

01-08 Trocar drainage catheter system

One-step drainage system



VISUAL RECOGNITION

Drainage catheter advanced over a stiff, sharp trocar stylet, forming a coaxial puncture-and-catheter assembly rather than a staged needle-wire-dilator sequence.

USE & PROCEDURAL CONTEXT

Trocar drainage system that advances a catheter over its sharp stylet into a selected, readily accessible fluid collection, avoiding a separate wire-and-dilator sequence. Typical contexts include superficial abscesses, pleural fluid, and other accessible collections.

KEY DISTINCTIONS

Unlike a Seldinger system, the trocar catheter advances directly with its sharp inner stylet, avoiding a separate guidewire and serial exchange steps; it is generally reserved for selected, readily accessible targets.

4. DIAGNOSTIC CATHETERS

04-01 Berenstein catheter

Angled selective catheter



VISUAL RECOGNITION

Typically 4- or 5-F catheter with a short, gently angled tip, similar in use to a Kumpe.

USE & PROCEDURAL CONTEXT

Single gentle angled-tip catheter for selecting branch vessels and directing wires in vascular and nonvascular anatomy. Typical procedural contexts include selective vascular access, biliary/GU wire direction, and general angiography.

KEY DISTINCTIONS

The Berenstein's short, gentle angled tip provides general branch selection and guidewire direction without the larger reverse curves or specialized visceral hooks of more complex catheter shapes.

04-02 Cobra 1 catheter

Visceral selective catheter



VISUAL RECOGNITION

Pre-shaped catheter with a Cobra-family downgoing hook and a shallower, less pronounced secondary curve than a Cobra 2.

USE & PROCEDURAL CONTEXT

Selects aortic branch vessels with caudal or oblique origins, including celiac, mesenteric, renal, adrenal, and other visceral branches. Typical contexts include visceral angiography, embolization, and venous sampling.

KEY DISTINCTIONS

The Cobra 1 is the smaller, shallower member of the Cobra family; compared with a Cobra 2, it offers less hook depth and reach while retaining direct downgoing selection.

04-03 Cobra 2 catheter

Visceral selective catheter



VISUAL RECOGNITION

Pre-shaped diagnostic catheter with the characteristic Cobra 2 distal configuration, including a hooked downgoing curve that reforms after the guidewire is withdrawn.

USE & PROCEDURAL CONTEXT

Downgoing-curve catheter for selecting aortic visceral branches, including the celiac, superior mesenteric (SMA), and renal arteries. Typical contexts include GI bleeding, trauma angiography, and visceral embolization.

KEY DISTINCTIONS

The Cobra 2 is defined by its downgoing hooked geometry for visceral branch engagement, in contrast to simple angled catheters used primarily for general wire direction.

04-04 Flush pigtail angiographic catheter

High-flow flush catheter



VISUAL RECOGNITION

Angiographic catheter with a curled pigtail distal tip and multiple side holes distributed near the loop, distinguishing it from end-hole selective catheters.

USE & PROCEDURAL CONTEXT

High-flow flush catheter for aortography and venography; multiple side holes disperse contrast and reduce focal jetting. Typical contexts include aortography, pelvic angiography, cavography, and venography.

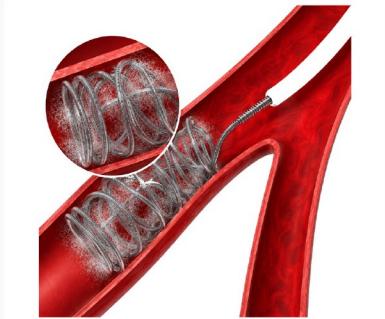
KEY DISTINCTIONS

Unlike a selective end-hole catheter, the pigtail's multiple side holes distribute contrast broadly rather than directing a single focal jet.

7. EMBOLICS

07-05 Embolization coils (pushable and detachable)

Pushable and detachable coils



VISUAL RECOGNITION

Metallic coils delivered through a catheter or microcatheter; pushable coils are advanced irreversibly, whereas detachable coils remain connected until intentional release.

USE & PROCEDURAL CONTEXT

Provides focal or segmental mechanical occlusion using pushable or detachable coils. Typical applications include vessel sacrifice, pseudoaneurysm or aneurysm embolization, bleeding control, variceal or collateral embolization, and other targeted occlusion tasks.

KEY DISTINCTIONS

Pushable coils are advanced irreversibly once released from the delivery catheter, whereas detachable coils permit controlled positioning and potential repositioning before final detachment.

07-06 Ethiodized oil (LIPIODOL®)

Radiopaque carrier oil



VISUAL RECOGNITION

Viscous, oily, highly radiopaque contrast medium supplied in a glass vial; its dense appearance and syrup-like handling distinguish it from standard aqueous contrast.

USE & PROCEDURAL CONTEXT

Radiopaque oil that serves as a TACE drug carrier and marker and as a lymphangiographic contrast for mapping or sealing leaks. Typical procedural contexts include TACE, glue-embolic mixtures, and lymphangiography.

KEY DISTINCTIONS

LIPIODOL® functions as a radiopaque oily carrier or lymphangiographic contrast rather than as a conventional water-soluble angiographic contrast agent or a stand-alone particulate embolic.

07-07 n-Butyl cyanoacrylate (n-BCA) liquid embolic

Adhesive liquid embolic



VISUAL RECOGNITION

Small glue vial mixed with Lipiodol to set polymerization time and add radiopacity.

USE & PROCEDURAL CONTEXT

Adhesive glue that polymerizes on blood or tissue contact for rapid permanent occlusion when mixed with ethiodized oil. Typical procedural contexts include bleeding, pseudoaneurysm, AVM, lymphatic leak, and varices.

KEY DISTINCTIONS

n-BCA is an adhesive liquid embolic that polymerizes rapidly on contact with blood or tissue, distinguishing it from nonadhesive liquid systems that form a cohesive cast more gradually.

07-08 Onyx™ liquid embolic system

Cohesive liquid embolic



VISUAL RECOGNITION

Black tantalum-loaded liquid in a vial requiring a DMSO-compatible microcatheter and shaking before use.

USE & PROCEDURAL CONTEXT

Provides controlled delivery of a nonadhesive liquid embolic that forms a cohesive cast within the target. Typical contexts include arteriovenous malformations, endoleaks, and other complex embolization procedures requiring slow, deliberate injection.

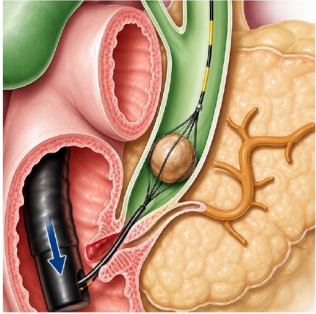
KEY DISTINCTIONS

Onyx™ is nonadhesive and forms a cohesive cast during controlled injection, distinguishing it from rapidly polymerizing adhesive agents such as n-BCA.

13. BILIARY & GENITOURINARY

13-05 Biliary stone retrieval basket

Stone retrieval basket



VISUAL RECOGNITION

Collapsible four- to six-wire basket that opens into a spherical cage inside the duct.

USE & PROCEDURAL CONTEXT

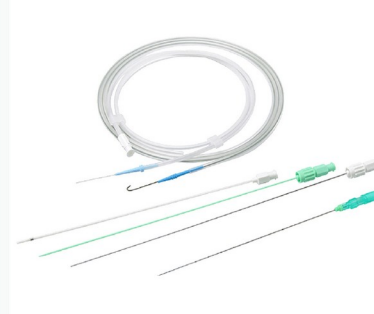
Wire basket opened within the duct to snare, extract, or push biliary stones and debris toward the bowel, clearing the biliary tree. Typical procedural contexts include retained or recurrent common-duct stones and percutaneous biliary stone clearance.

KEY DISTINCTIONS

The collapsible wire basket captures or repositions intraductal stones and debris, distinguishing it from balloons used for dilation or occlusion and from brushes used for cytology.

13-06 Coaxial transitional access set

Transitional access set



VISUAL RECOGNITION

Small-caliber access kit containing a fine needle, 0.018-inch guidewire, and coaxial transitional dilator or cannula that accepts a 0.035-inch guidewire.

USE & PROCEDURAL CONTEXT

Provides atraumatic small-target percutaneous access by converting a fine needle and 0.018-inch guidewire entry into a larger working platform for subsequent biliary, genitourinary, or other tract-based intervention.

KEY DISTINCTIONS

The defining role is platform conversion: a fine 0.018-inch access pathway is enlarged to accept a 0.035-inch guidewire and subsequent working devices.

13-07 Covered self-expanding metal biliary stent

Covered biliary SEMS



VISUAL RECOGNITION

Self-expanding metal stent with a continuous covering on a biliary delivery catheter.

USE & PROCEDURAL CONTEXT

Fabric- or polymer-covered self-expanding metal stent that relieves obstruction or seals a leak while its lining resists tumor and tissue ingrowth to prolong patency. Typical procedural contexts include malignant biliary obstruction, biliary leak or fistula, and selected refractory strictures.

KEY DISTINCTIONS

The continuous covering blocks tissue ingrowth and creates a lined conduit, distinguishing this stent from an uncovered biliary stent with open metal mesh.

13-08 Double-J ureteral stent

Internal ureteral stent



VISUAL RECOGNITION

Soft polymer stent with a J or pigtail curl at each end, spanning the ureter.

USE & PROCEDURAL CONTEXT

Provides completely internal ureteral drainage across obstruction, stricture, stones, or a recently treated segment by spanning the renal pelvis to the bladder without an external catheter limb.

KEY DISTINCTIONS

The two curled ends anchor the stent internally in the renal pelvis and bladder, allowing completely internal urinary drainage without an external catheter limb.

15. IMAGE-GUIDED BIOPSY, ABLATION & AUGMENTATION

15-05 Cryoablation probe

Iceball ablation probe



VISUAL RECOGNITION

Rigid percutaneous needle-probe connected proximally to dedicated gas lines; the distal active segment is the portion around which the treatment iceball develops.

USE & PROCEDURAL CONTEXT

Needle-probe that rapidly expands argon at its tip (Joule-Thomson effect) to grow a lethal, CT/US-visible iceball, then thaws with helium. Typical procedural contexts include renal masses, lung and bone tumors, soft-tissue tumors, and pain palliation.

KEY DISTINCTIONS

The defining procedural clue is formation of an image-visible iceball around the probe tip, distinguishing cryoablation from heat-based probe systems in this section.

15-06 Fiducial marker

Radiopaque targeting markers



VISUAL RECOGNITION

Tiny gold cylinders or coils preloaded in a needle, deployed through a coaxial introducer.

USE & PROCEDURAL CONTEXT

Small radiopaque seeds implanted in or near a tumor under image guidance to provide targets for stereotactic radiotherapy tracking or surgical localization. Typical procedural contexts include SBRT planning for lung, liver, pancreatic, and prostate tumors.

KEY DISTINCTIONS

Fiducials are implanted radiopaque reference markers rather than biopsy or ablation devices; their purpose is to provide a stable localization target for subsequent image-guided therapy or surgery.

15-07 Fine-needle aspiration (FNA) needle

Cytology aspiration needle



VISUAL RECOGNITION

Very fine 22- to 25-gauge aspiration needle used with a syringe or aspiration handle, with a substantially smaller caliber than a core biopsy needle.

USE & PROCEDURAL CONTEXT

Obtains cellular material for cytologic evaluation using a very fine aspiration needle rather than a core-cutting system. Typical targets include thyroid nodules, lymph nodes, cystic lesions, and selected masses.

KEY DISTINCTIONS

FNA retrieves cellular material for cytologic evaluation through a very fine needle, distinguishing it from core biopsy, which removes an intact tissue cylinder for histology.

15-08 Microwave ablation antenna

Microwave ablation antenna



VISUAL RECOGNITION

Rigid antenna with a coaxial cable to a microwave generator, often with a shaft-cooling jacket.

USE & PROCEDURAL CONTEXT

Antenna that radiates microwave energy to agitate water molecules and heat tissue to coagulative necrosis, giving fast, large, high-temperature zones less prone to heat-sink than RF. Typical procedural contexts include liver, kidney, lung, adrenal, bone, and soft-tissue tumor ablation.

KEY DISTINCTIONS

Microwave ablation delivers electromagnetic energy through an antenna to create thermal coagulation, distinguishing it from radiofrequency electrodes and cryoablation probes that use different energy mechanisms.

17. TIPS & PORTAL HYPERTENSION

17-01

BRT0 occlusion balloon catheter

BRT0 occlusion balloon



VISUAL RECOGNITION

Balloon-tipped catheter positioned in the portosystemic shunt outflow, with a compliant distal balloon that is inflated during sclerosant instillation.

USE & PROCEDURAL CONTEXT

Compliant balloon inflated in the gastroduodenal shunt to block outflow so injected sclerosant dwells within and obliterates gastric varices during balloon-occluded retrograde transvenous obliteration. Typical procedural contexts include BRT0 for gastric varices and management of portosystemic shunts.

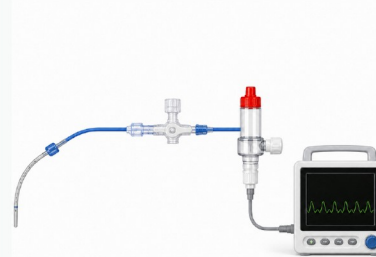
KEY DISTINCTIONS

The balloon's role is prolonged shunt-outflow occlusion so sclerosant can dwell within the target variceal complex, rather than angioplasty or short-duration diagnostic flow arrest.

17-02

Portal pressure transduction system

Portal pressure monitoring system



VISUAL RECOGNITION

Fluid-filled catheter and pressure-transducer setup connected to a monitor, with stopcocks and a pressurized flush line.

USE & PROCEDURAL CONTEXT

Measures portal, hepatic venous, and systemic venous pressures and pressure gradients during TIPS creation, TIPS revision, and other portal-hypertension assessments using a fluid-filled catheter and transducer setup.

KEY DISTINCTIONS

This is a hemodynamic measurement setup rather than a unique catheter shape; accurate values depend on correct leveling, zeroing, and an intact fluid-filled pressure circuit.

17-03

TIPS portal access system

Transjugular portal access system



VISUAL RECOGNITION

Long curved transjugular sheath and cannula system containing a dedicated portal-puncture needle for directing a controlled pass from a hepatic vein toward the portal vein.

USE & PROCEDURAL CONTEXT

Creates controlled transhepatic portal venous access from a transjugular hepatic-vein approach during TIPS creation and selected advanced portal interventions.

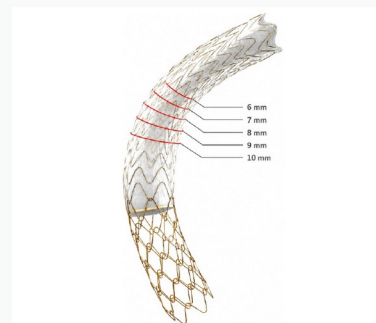
KEY DISTINCTIONS

The TIPS access system integrates the curved working sheath or cannula with a dedicated portal-puncture needle; Colapinto and Röscher-Uchida-type configurations are representative variants.

17-04

TIPS stent-graft

Dedicated TIPS endoprosthesis



VISUAL RECOGNITION

Hybrid stent with a PTFE-covered hepatic portion and an uncovered portal end.

USE & PROCEDURAL CONTEXT

Dedicated TIPS endoprosthesis (Gore) with a covered shunt segment and a bare portal-vein segment for durable shunt patency. Typical procedural contexts include TIPS creation and revision.

KEY DISTINCTIONS

The hybrid implant combines a covered shunt segment with an uncovered portal-vein end, a configuration specifically designed for TIPS rather than general peripheral stent-graft use.

S2 - Supplementary Material

Complete Atlas Entry Inventory

Device Education in Interventional Radiology: Development of a Structured Visual Atlas

This inventory enumerates all 171 entries across 18 sections in the First Edition 2027 atlas. Internal tracking codes and section assignments match the current device inventory and device panels. Product-specific entry titles were normalized to generic device classes where appropriate; established eponyms and common table terminology were retained when they aid recognition.

Internal Tracking Code	Generic or Common Device Name	Atlas Section
01-01	18-gauge access needle	01. Access
01-02	21-gauge micropuncture access needle	01. Access
01-03	Chiba needle	01. Access
01-04	Hemostatic forceps (Kelly and Mosquito)	01. Access
01-05	Micropuncture set	01. Access
01-06	No. 11 scalpel blade	01. Access
01-07	Spinal needle	01. Access
01-08	Trocar drainage catheter system	01. Access
01-09	Yueh needle-catheter system	01. Access
02-01	0.014-inch peripheral guidewire	02. Wires
02-02	0.018-inch micropuncture guidewire	02. Wires
02-03	0.018-inch peripheral guidewire	02. Wires
02-04	0.035-inch Bentson guidewire	02. Wires
02-05	0.035-inch hydrophilic guidewire	02. Wires
02-06	0.035-inch J-tip guidewire	02. Wires
02-07	0.035-inch Rosen guidewire	02. Wires
02-08	Amplatz stiff guidewire	02. Wires
02-09	Extra-stiff supportive guidewire	02. Wires
03-01	Large-bore vascular sheath	03. Sheaths & Dilators
03-02	Long guiding sheath	03. Sheaths & Dilators
03-03	Micropuncture introducer sheath	03. Sheaths & Dilators
03-04	Splittable introducer sheath	03. Sheaths & Dilators
03-05	Rotating hemostatic valve	03. Sheaths & Dilators
03-06	Serial tract dilators	03. Sheaths & Dilators
03-07	Vascular introducer sheath	03. Sheaths & Dilators
04-01	Berenstein catheter	04. Diagnostic Catheters
04-02	Cobra 1 catheter	04. Diagnostic Catheters
04-03	Cobra 2 catheter	04. Diagnostic Catheters
04-04	Flush pigtail angiographic catheter	04. Diagnostic Catheters
04-05	Headhunter 1 catheter	04. Diagnostic Catheters
04-06	Kumpe catheter	04. Diagnostic Catheters

Internal Tracking Code	Generic or Common Device Name	Atlas Section
04-07	Mikaelsson catheter	04. Diagnostic Catheters
04-08	Multipurpose angiographic catheter	04. Diagnostic Catheters
04-09	Omni Flush catheter	04. Diagnostic Catheters
04-10	Renal double curve (RDC) catheter	04. Diagnostic Catheters
04-11	Shepherd hook catheter	04. Diagnostic Catheters
04-12	Simmons 1 catheter	04. Diagnostic Catheters
04-13	Simmons 2 catheter	04. Diagnostic Catheters
04-14	Simmons 3 catheter	04. Diagnostic Catheters
04-15	Reverse-curve diagnostic catheter	04. Diagnostic Catheters
04-16	Vertebral catheter	04. Diagnostic Catheters
05-01	Balloon-occlusion microcatheter	05. Microcatheters, Microwires & Crossing Systems
05-02	Chronic total occlusion (CTO) re-entry device	05. Microcatheters, Microwires & Crossing Systems
05-03	Coaxial microcatheter	05. Microcatheters, Microwires & Crossing Systems
05-04	Crossing support catheter	05. Microcatheters, Microwires & Crossing Systems
05-05	Microguidewire	05. Microcatheters, Microwires & Crossing Systems
05-06	Torqueable microcatheter	05. Microcatheters, Microwires & Crossing Systems
06-01	Angiographic manifold	06. Contrast & Table Setup
06-02	CO ₂ angiography delivery system	06. Contrast & Table Setup
06-03	Contrast power injector	06. Contrast & Table Setup
06-04	Hand-injection contrast syringe	06. Contrast & Table Setup
06-05	Luer-lock connector	06. Contrast & Table Setup
06-06	Power-injector tubing	06. Contrast & Table Setup
06-07	Pressure infusion bag	06. Contrast & Table Setup
06-08	Pressure transducer system	06. Contrast & Table Setup
06-09	Three-way stopcock	06. Contrast & Table Setup
07-01	Absolute ethanol	07. Embolics
07-02	Absorbable gelatin sponge embolic	07. Embolics
07-03	Calibrated embolic microspheres	07. Embolics
07-04	Drug-eluting embolic microspheres	07. Embolics
07-05	Embolization coils (pushable and detachable)	07. Embolics
07-06	Ethiodized oil	07. Embolics
07-07	n-Butyl cyanoacrylate (n-BCA) liquid embolic	07. Embolics
07-08	Ethylene-vinyl alcohol copolymer liquid embolic system	07. Embolics
07-09	Polyvinyl alcohol (PVA) particles	07. Embolics
07-10	Sodium tetradecyl sulfate sclerosant	07. Embolics
07-11	Technetium-99m MAA	07. Embolics
07-12	Vascular plug	07. Embolics
07-13	Yttrium-90 radioembolization microspheres	07. Embolics
08-01	Balloon inflation device	08. Balloons

Internal Tracking Code	Generic or Common Device Name	Atlas Section
08-02	Compliant aortic molding balloon catheter	08. Balloons
08-03	Cutting/scoring angioplasty balloon	08. Balloons
08-04	Drug-coated angioplasty balloon	08. Balloons
08-05	High-pressure angioplasty balloon	08. Balloons
08-06	Intravascular lithotripsy (IVL) catheter	08. Balloons
08-07	Occlusion balloon catheter	08. Balloons
08-08	PTA balloon catheter	08. Balloons
08-09	Peripheral atherectomy device	08. Balloons
09-01	Balloon-expandable covered stent	09. Stents & Stent Grafts
09-02	Balloon-expandable stent	09. Stents & Stent Grafts
09-03	Dedicated venous stent system	09. Stents & Stent Grafts
09-04	Drug-eluting peripheral arterial stent	09. Stents & Stent Grafts
09-05	Endovascular aortic stent-graft system	09. Stents & Stent Grafts
09-06	Interwoven nitinol stent	09. Stents & Stent Grafts
09-07	Self-expanding bare-metal stent	09. Stents & Stent Grafts
09-08	Self-expanding stent-graft	09. Stents & Stent Grafts
10-01	Alteplase (tPA) thrombolytic agent	10. Thrombectomy & Lysis
10-02	Rheolytic thrombectomy system	10. Thrombectomy & Lysis
10-03	Mechanical venous thrombectomy system	10. Thrombectomy & Lysis
10-04	Ultrasound-assisted thrombolysis system	10. Thrombectomy & Lysis
10-05	Large-bore mechanical thrombectomy system	10. Thrombectomy & Lysis
10-06	Aspiration thrombectomy system	10. Thrombectomy & Lysis
10-07	Multi-side-hole thrombolysis catheter	10. Thrombectomy & Lysis
11-01	Distal embolic protection device	11. Embolic Protection, Retrieval & IVC Filters
11-02	Endovascular loop snare	11. Embolic Protection, Retrieval & IVC Filters
11-03	Endovascular retrieval basket	11. Embolic Protection, Retrieval & IVC Filters
11-04	Endovascular retrieval forceps	11. Embolic Protection, Retrieval & IVC Filters
11-05	IVC filter	11. Embolic Protection, Retrieval & IVC Filters
11-06	IVC filter delivery system	11. Embolic Protection, Retrieval & IVC Filters
11-07	IVC filter retrieval sheath	11. Embolic Protection, Retrieval & IVC Filters
12-01	Gastrojejunostomy (GJ) tube	12. Drains & Enteral Access
12-02	Gastropexy T-fasteners	12. Drains & Enteral Access
12-03	Gastrostomy (G) tube	12. Drains & Enteral Access
12-04	Locking pigtail drainage catheter	12. Drains & Enteral Access
12-05	Malecot drainage catheter	12. Drains & Enteral Access
12-06	Nonlocking pigtail drainage catheter	12. Drains & Enteral Access
12-07	Small-bore pigtail thoracostomy catheter	12. Drains & Enteral Access
12-08	Thoracentesis and paracentesis catheter	12. Drains & Enteral Access
12-09	Tunneled pleural/peritoneal drain	12. Drains & Enteral Access

Internal Tracking Code	Generic or Common Device Name	Atlas Section
13-01	Biliary access sheath	13. Biliary & Genitourinary
13-02	Biliary angioplasty balloon catheter	13. Biliary & Genitourinary
13-03	Biliary cytology brush	13. Biliary & Genitourinary
13-04	Biliary occlusion balloon catheter	13. Biliary & Genitourinary
13-05	Biliary stone retrieval basket	13. Biliary & Genitourinary
13-06	Coaxial transitional access set	13. Biliary & Genitourinary
13-07	Covered self-expanding metal biliary stent	13. Biliary & Genitourinary
13-08	Double-J ureteral stent	13. Biliary & Genitourinary
13-09	External biliary drainage catheter	13. Biliary & Genitourinary
13-10	Internal-external biliary drainage catheter	13. Biliary & Genitourinary
13-11	Nephroureteral catheter	13. Biliary & Genitourinary
13-12	Percutaneous cholecystostomy catheter	13. Biliary & Genitourinary
13-13	Percutaneous nephrostomy catheter	13. Biliary & Genitourinary
13-14	Suprapubic cystostomy catheter	13. Biliary & Genitourinary
13-15	Uncovered self-expanding metal biliary stent	13. Biliary & Genitourinary
13-16	Ureteral access catheter	13. Biliary & Genitourinary
14-01	Implanted venous access port	14. Central Venous Access
14-02	Midline catheter	14. Central Venous Access
14-03	Noncoring port access needle (Huber needle)	14. Central Venous Access
14-04	Nontunneled central venous catheter	14. Central Venous Access
14-05	Nontunneled hemodialysis catheter	14. Central Venous Access
14-06	Peripherally inserted central catheter (PICC)	14. Central Venous Access
14-07	Subcutaneous catheter tunneler	14. Central Venous Access
14-08	Tunneled hemodialysis catheter	14. Central Venous Access
14-09	Tunneled small-bore central venous catheter	14. Central Venous Access
15-01	Automated core biopsy device	15. Image-Guided Biopsy, Ablation & Augmentation
15-02	Bone access and biopsy system	15. Image-Guided Biopsy, Ablation & Augmentation
15-03	Coaxial biopsy introducer needle	15. Image-Guided Biopsy, Ablation & Augmentation
15-04	Core biopsy needle	15. Image-Guided Biopsy, Ablation & Augmentation
15-05	Cryoablation probe	15. Image-Guided Biopsy, Ablation & Augmentation
15-06	Fiducial marker	15. Image-Guided Biopsy, Ablation & Augmentation
15-07	Fine-needle aspiration (FNA) needle	15. Image-Guided Biopsy, Ablation & Augmentation
15-08	Microwave ablation antenna	15. Image-Guided Biopsy, Ablation & Augmentation
15-09	Protective displacement system	15. Image-Guided Biopsy, Ablation & Augmentation
15-10	Radiofrequency ablation electrode	15. Image-Guided Biopsy, Ablation & Augmentation
15-11	Transjugular liver biopsy set	15. Image-Guided Biopsy, Ablation & Augmentation
15-12	Vertebral augmentation/kyphoplasty system	15. Image-Guided Biopsy, Ablation & Augmentation
16-01	AV dialysis access sheath	16. AV Dialysis Access
16-02	AV dialysis access stent-graft	16. AV Dialysis Access

Internal Tracking Code	Generic or Common Device Name	Atlas Section
16-03	Arterial balloon embolectomy catheter	16. AV Dialysis Access
16-04	Rotational mechanical thrombectomy device	16. AV Dialysis Access
16-05	Ultra-high-pressure balloon catheter	16. AV Dialysis Access
17-01	BRTO occlusion balloon catheter	17. TIPS & Portal Hypertension
17-02	Portal pressure transduction system	17. TIPS & Portal Hypertension
17-03	TIPS portal access system	17. TIPS & Portal Hypertension
17-04	TIPS stent-graft	17. TIPS & Portal Hypertension
18-01	Collagen-plug vascular closure device	18. Closure, Hemostasis & Securement
18-02	Chlorhexidine-impregnated dressing	18. Closure, Hemostasis & Securement
18-03	Cyanoacrylate topical skin adhesive	18. Closure, Hemostasis & Securement
18-04	External mechanical compression device	18. Closure, Hemostasis & Securement
18-05	Extravascular sealant closure device	18. Closure, Hemostasis & Securement
18-06	Large-bore femoral vascular closure device	18. Closure, Hemostasis & Securement
18-07	Needleless catheter connector and cap	18. Closure, Hemostasis & Securement
18-08	Suture-mediated vascular closure system	18. Closure, Hemostasis & Securement
18-09	Pressure dressing	18. Closure, Hemostasis & Securement
18-10	Adhesive skin closure strips	18. Closure, Hemostasis & Securement
18-11	Suture materials	18. Closure, Hemostasis & Securement
18-12	Sutureless catheter securement device	18. Closure, Hemostasis & Securement
18-13	Thrombin injection	18. Closure, Hemostasis & Securement
18-14	Topical hemostatic agent	18. Closure, Hemostasis & Securement
18-15	Radial compression device	18. Closure, Hemostasis & Securement
18-16	Transparent film dressing	18. Closure, Hemostasis & Securement