Appendix B — Chapter register

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The register lists every chapter with its guiding question, intended readers, prerequisites, learning activity, course workshop and primary source. It is also available as a machine-readable file: `editorial/chapter-register.csv`.

Table B.1: Chapters B01–B28 with guiding question, course workshop and lab.

B-ID	Part	Title	Guiding question	W-ID	Path status	R lab
I	Clinical decisions and the translational chain	Who will do something differently because of the output?	Medical students, clinical researchers and doctoral candidates new to data analysis	Required (W1 core reading)	Yes: first R steps, pathway data frame, first ggplot2 graphic with expected output, decision-map completeness check, rows vs independent units of both teaching datasets, timing counter-check (4 stopifnot)	fig-b01-pathway (pathway timeline), tbl-b01-map (decision map)
I	Describe, predict, explain	Which target quantity answers the actual question?	Clinicians and researchers planning analyses of routine or registry data	Required (W5 core reading)	Yes: dagitty adjustment sets, simulation of 4,000 patients, crude vs adjusted vs ICU-only risk differences, explanation of the sign flip, 100 repetitions, prognostic logistic model, counter-check without the delay-to-ICU arrow (6 stopifnot)	fig-b02-dag (DAG), tbl-b02-questions (three questions)
I	How data arise: missingness and denominators	Which patient, animal or sample is missing from the table?	Students and clinical researchers who collect or receive clinical or experimental data	Required (W1 core reading)	Yes: patient and visit tables, dictionary, counts and means per window, two-path count of patients, measurements and linked records, spaghetti plot, denominator figure, CSV export, HSI pseudoreplication, k-anonymity of a registry extract, counter-check with hidden values (7 stopifnot)	fig-b03-trajectories, fig-b03-denominators, tbl-b03-status, tbl-b03-dictionary
I	Reconstructing a research project in R	Can a colleague regenerate the number in the figure?	Anyone handing over, reviewing or reusing an analysis, R beginners	Supplementary (recommended reading)	Yes: R objects, relative path, base graphic, long and wide, five scripts executed in memory, two-path counts, target value V4 = 0.56 m/s (n = 7 of 12), SHA-256 comparison with the B03 file, sessionInfo, Quarto report and Git listings, artefact register, firmware counter-check (9 stopifnot)	fig-b04-windows (base R), tbl-b04-artefacts

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II	From baseline to learning model	Which additional effort delivers an improvement that matters for a decision?	Clinicians, doctoral researchers and reviewers building or appraising a first prediction model	Supplementary (recommended reading for W1 and W3)	Yes: synthetic delirium cohort (1,200 patients, constant IDs, 800/400 split), exported to data/b05-delirium-cohort.csv, 8 stopifnot checks	Fig. 5.1 test AUC with bootstrap intervals and cases found at 30% capacity (n = 400 test patients, 103 events), Table 5.1 where each step happens
II	Accuracy, calibration and clinical utility	When does a good ranking lead to the wrong action?	Clinicians, nurses, doctoral researchers and reviewers who set thresholds	Required (W3 core reading)	Yes: reads the B05 test patients (checksum of test IDs), 9 stopifnot checks	Fig. 6.1 calibration plot (10 groups of 40, n = 400), Fig. 6.2 decision curve, Tables 6.1 and 6.2
II	Reading an AI study critically	Which findings support measurement quality, and which support better care?	Clinicians preparing a journal club, decision-support committees, reviewers	Required (W2 core reading)	Yes: reconstruction from published counts with stopifnot (3 checks), journal-club card as data frame	Table 7.1 tools and checks, Table 7.2 checked statement, Table 7.3 reconstructed 2 x 2 table (n = 38,455 hospitalisations, published)
II	Language models in clinic and science	Which statement can be checked after generation?	Clinicians, researchers, teachers and students who use or review generated text	Required (W2 core reading)	Yes: stored answers exported to data/b08-stored-answers.csv, 8 stopifnot checks	Fig. 8.1 share of false, true and other sentences at three temperatures (2,000 generated sentences each), Table 8.1 evidence card

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III	A fracture alert in the emergency department	What does an alert mean when the prevalence changes?	Clinicians, medical students and reviewers acting on an image-analysis alert	required (W3 core reading)	Base R: fourfold counts, PPV/NPV, alerts per shift, counter-check with specificity 80%. stopifnot: 45/140 and 180/260, 32.1% and 69.2%. Download: data/b09-fracture-alert-cohorts.csv	fig-b09-icons (icon array, n = 1,000 patients per setting), fig-b09-ppv (PPV vs prevalence), tbl-b09-fourfold
III	Hyperspectral imaging	What separates a biological signal from illumination and device characteristics?	Doctoral researchers and preclinical teams analysing spectral images, reviewers	required (W4 core reading)	Base R plus class::knn and prcomp. stopifnot: grey-tile tolerance, pixel vs animal p-value pattern, index accuracy >= model accuracy on new animals, 50% under stale calibration, brightness-only counter-check	fig-b10-chain (measurement chain), fig-b10-index (index per animal, n = 8), tbl-b10-units
III	Measuring gait from video	Are two measurement methods similar enough for this rehabilitation decision?	Physiotherapists, rehabilitation and trauma clinicians, researchers comparing measurement methods	supplementary (W4 gait station)	Base R plus ggplot2. stopifnot: two hand-checked angles, step-level limits outside and 10-step limits inside tolerance, wider bias CI with patients as unit, bias shift with 30 degree yaw. Download: data/b11-gait-steps.csv	fig-b11-chain, fig-b11-perspective (error vs camera yaw), fig-b11-ba (Bland-Altman, n = 24 patients)
III	Spatial biology and image analysis	How does a segmentation decision change the biological conclusion?	Researchers in pathology and translational immunology, doctoral researchers, reviewers of spatial analyses	supplementary (W4 tissue station)	Base R plus ggplot2. stopifnot: design (12 patients, 36 fields, minimum distance), monotone shares, cell-level p < 0.01 but patient-level p > 0.05 at 4 micrometres, ratio test p > 0.05, edge correction raises share	fig-b12-chain, fig-b12-field (detail at 1 and 4 micrometres), fig-b12-shift (share and ratio vs expansion, n = 12 patients)

B-ID	Part	Title	Guiding question	W-ID	Path status	R lab
IV	Longitudinal biomarkers	Whose course does the estimated slope describe?	Clinical researchers, doctoral students and reviewers working with repeated laboratory values	required (core reading W5)	Yes: synthetic cohort of 36 persons (186 of 216 planned values), 21 stopifnot conditions, CSV data/b13-selenium-synthetic.csv	fig-b13-spaghetti (spaghetti plot with persons measured per visit), fig-b13-delta (tipping-point curve)
IV	Cluster, gradient or artefact	When does a figure become a testable subtype hypothesis?	Translational researchers, doctoral students and reviewers of patient cluster maps	supplementary (recommended reading W5)	Yes: 300 synthetic persons from one continuous gradient, 12 stopifnot conditions	fig-b14-slices (PCA map and stacked PC1 histogram), fig-b14-countercheck (gradient vs gap)
IV	Mechanistic models and pharmacometrics	Which sampling times make it possible to separate clearance from volume?	Clinical pharmacology trainees, doctoral students planning sampling, reviewers of PK analyses	required (core reading W6, alternative to B18)	Yes: virtual parameters only (dose 100 mg, V 20 L, CL 5 L/h), 16 stopifnot conditions	fig-b15-identifiability (curves coinciding at 4 h, normalised sensitivities)
IV	Bayes, small samples and the 3Rs	What uncertainty remains even when an event rate looks striking?	Preclinical researchers, doctoral students, animal welfare bodies, reviewers of small experiments	supplementary (recommended reading W5 and W6)	Yes: 10 fictitious rats (7/9 bridged), 16 stopifnot conditions	fig-b16-posteriors (priors, posteriors and intervals)

B-ID	Part	Title	Guiding question	W-ID	Path status	R lab
V	Forecasting patient flow	Is the forecast interval of an emergency department usable for next week?	ED and nursing leads planning rosters, hospital operations analysts, clinicians reading forecast dashboards	Required	Yes: synthetic negative-binomial hourly arrivals (26 weeks), forecast::snaive checked against hand computation, temporal train/test check; writes data/b17-ed-arrivals.csv	fig-b17-coverage (weekly coverage, n = 18 forecast weeks), fig-b17-surge, fig-b17-shiftmap, tbl-b17-summary
V	Mass casualty incidents, operating capacity and simulation	Which resource limits care in the scenario under study?	Trauma surgeons, anaesthetists and nurses writing mass casualty plans, emergency planners, operations analysts	Required (elective with B15)	Yes: simmer::add_dataframe with stored arrivals/service times, digest fingerprint of event lists; writes data/b18-event-list.csv	fig-b18-waits (wait for OR by triage and scenario, 200 replications), tbl-b18-summary
V	From one centre or species to the next	To which new case should the claim refer?	Doctoral researchers in preclinical imaging, clinical teams planning validations, reviewers	Required	Yes: base R hand calculation with stopifnot target values, class::knn on synthetic spectra (seed 4419, separate knn_ objects); writes data/b19-spectra.csv incl. fold columns	fig-b19-splitplan (printable split plan, n = 4 animals), fig-b19-spectra, tbl-b19-levels, tbl-b19-splitplan, tbl-b19-repeat
V	Pilot operation, impact and monitoring	Which observation would stop the introduction?	Clinical leads of pilots, physicians and nurses acting as human oversight, quality and patient safety officers, reviewers of early clinical evaluations	Supplementary	Yes: base R simulation (seed 2003), qbeta exact intervals, Poisson stop rule, suppression check	fig-b20-pchart (weekly night-shift alert share, n = 20 weeks), tbl-b20-sheet (monitoring sheet)

B-ID	Part	Title	Guiding question	W-ID	Path status	R lab
VI	Ethics at the bedside and in study design	Who bears the harm of a wrong decision, and who can object?	Clinicians, nurses, researchers, reviewers	Supplementary	Yes: synthetic group counts for setting A, Wilson intervals checked against prop.test(), counter-checks for setting B and larger denominators (stopifnot)	fig-b21-subgroups (error rates by group, n = 1,000 patients)
VI	Regulating research software and clinical AI	Which change in the intended purpose changes the regulatory question?	Research teams, clinical IT, regulatory staff, clinicians, reviewers	Required (W7)	No lab (decision exercise), timeline figure with date checks (stopifnot)	fig-b22-timeline (legal dates, status 8 November 2026)
VI	Data protection along the entire data flow	Who receives which data, for what purpose, and for how long?	Clinical researchers, data stewards, teachers, reviewers	Required (W7)	Yes: data-flow register with rule checks, two counter-check versions, 72-hour clock (stopifnot)	fig-b23-flow (data flow with identifiability, boundaries and deletion points, fictional)
VI	Information security and recovery	How does a team protect findings data, the model version and availability?	Clinical IT, research software engineers, data stewards, clinical leads	Supplementary	Yes: role-based access test, SHA-256 release check with digest, hash-chained log, restore test with three synthetic cases, two counter-checks (stopifnot)	fig-b24-threat (threat model with trust boundaries and attack surface, fictional)

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VII	Security risks of learning and generative systems	Which instruction or input may cross a trust boundary?	clinical teams introducing an assistant or model service, research software engineers, information security officers, reviewers	supplementary	yes: simulated access service (8 synthetic requests, 3 configurations), checksum check of a model artefact with digest, minimal log, stopifnot	fig-b25-control-matrix, tbl-b25-boundaries
VII	Secondary use and responsible open science	Which form of scientific traceability holds up when the data are sensitive?	clinical and doctoral researchers who publish, data stewards, ethics and data access committees, reviewers	supplementary	yes: synthetic registry extract (600 records, rare group of 3), equivalence classes, homogeneity, primary and secondary suppression, data dictionary check, stopifnot	fig-b26-classes, tbl-b26-access-matrix, tbl-b26-ehds
VII	Model passport, study report and decision	Which evidence does an independent team need for exactly this target statement?	project groups, doctoral researchers before colloquium or submission, reviewers, decision makers	required	yes: B19 teaching case (4/4 spectra known animals, 3/6 spectra and 1/2 animals new animals, ID overlap 0), exact intervals with qbeta, passport built from the analysis, stopifnot	fig-b27-denominators, tbl-b27-reporting-paths, tbl-b27-passport, tbl-b27-decision-sheet, tbl-b27-counter-review, tbl-b27-blank-passport, tbl-b27-blank-decision
VII	Case atlas, glossary and transfer	From which decision do I find the right method again?	all readers starting a project, course participants in W1 and W8, supervisors	required	yes: tables stored as data, consistency checks (all 28 chapters reachable, no dangling IDs, at least 60 glossary terms), route search for two reader tasks, path extension when the target changes, stopifnot	fig-b28-atlas-map, tbl-b28-risk, tbl-b28-goal, tbl-b28-data, tbl-b28-glossary, tbl-b28-mistakes, tbl-b28-next