ZSURx Clinical Pharmacy Toolkit

Complete Training Manual

A progressive learning guide: orientation -> reference -> core calculations -> clinical workflows -> advanced pharmacokinetics.

Training edition • 153 pages • Indexed and bookmarked

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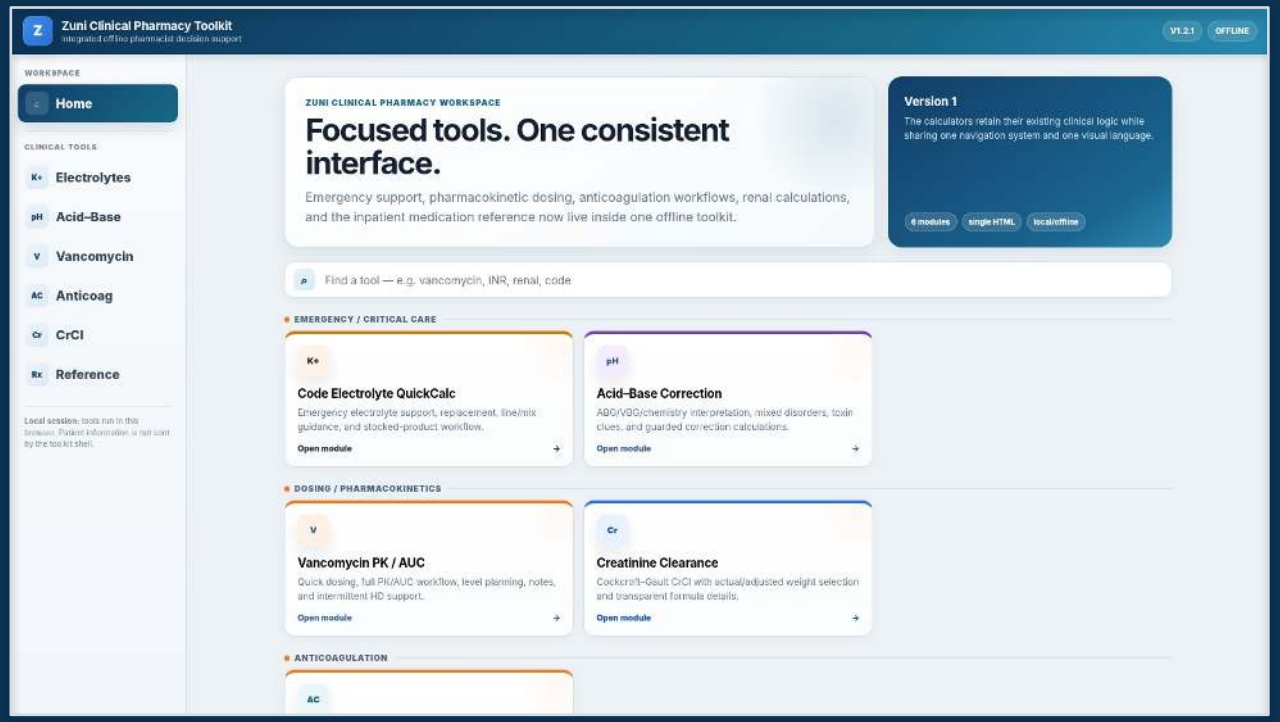
ZSURx

Getting Started

A quick visual guide to the Zuni Clinical Pharmacy Toolkit

zsurx.com

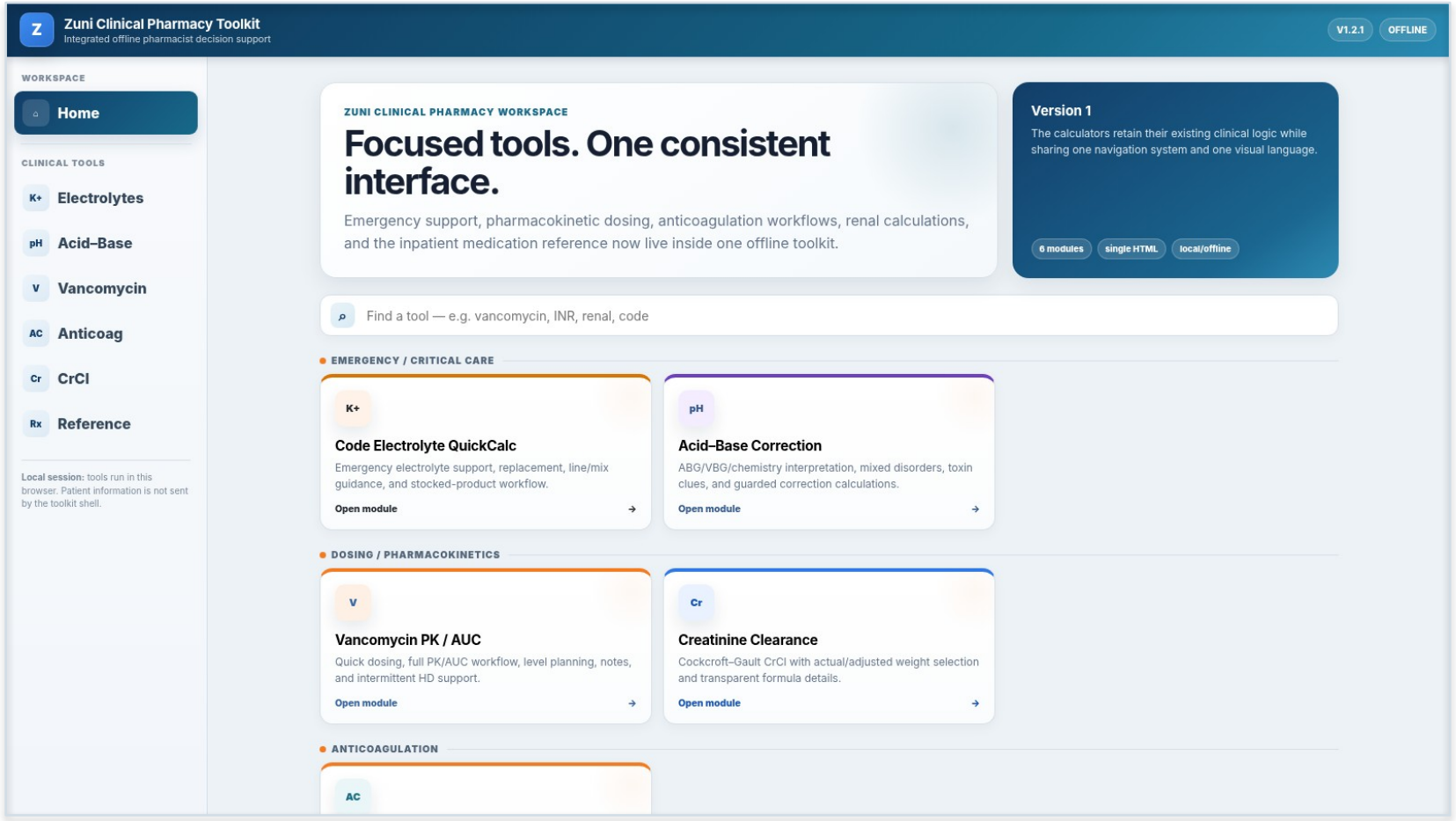
One workspace for emergency support, dosing/PK, anticoagulation, renal calculations, and inpatient medication reference.



1

Start at the ZSURx workspace

The home screen is the launch point for every clinical module.



1. **Left navigation stays available throughout the toolkit.**
2. **Tools are grouped by clinical purpose.**
3. **Open a module from its card or the sidebar.**
4. **The LOCAL/OFFLINE indicators identify the toolkit’s local-session design.**

Tip: bookmark zsurx.com on your workstation for faster access.

2

Choose the tool that matches the task

Six modules are available in the current release.

K+

Electrolytes

Emergency replacement & code support

pH

Acid–Base

ABG/VBG & correction support

V

Vancomycin

PK/AUC dosing & level planning

AC

Anticoagulation

Heparin, warfarin & transitions

Cr

CrCl

Cockcroft–Gault renal estimate

Rx

Reference

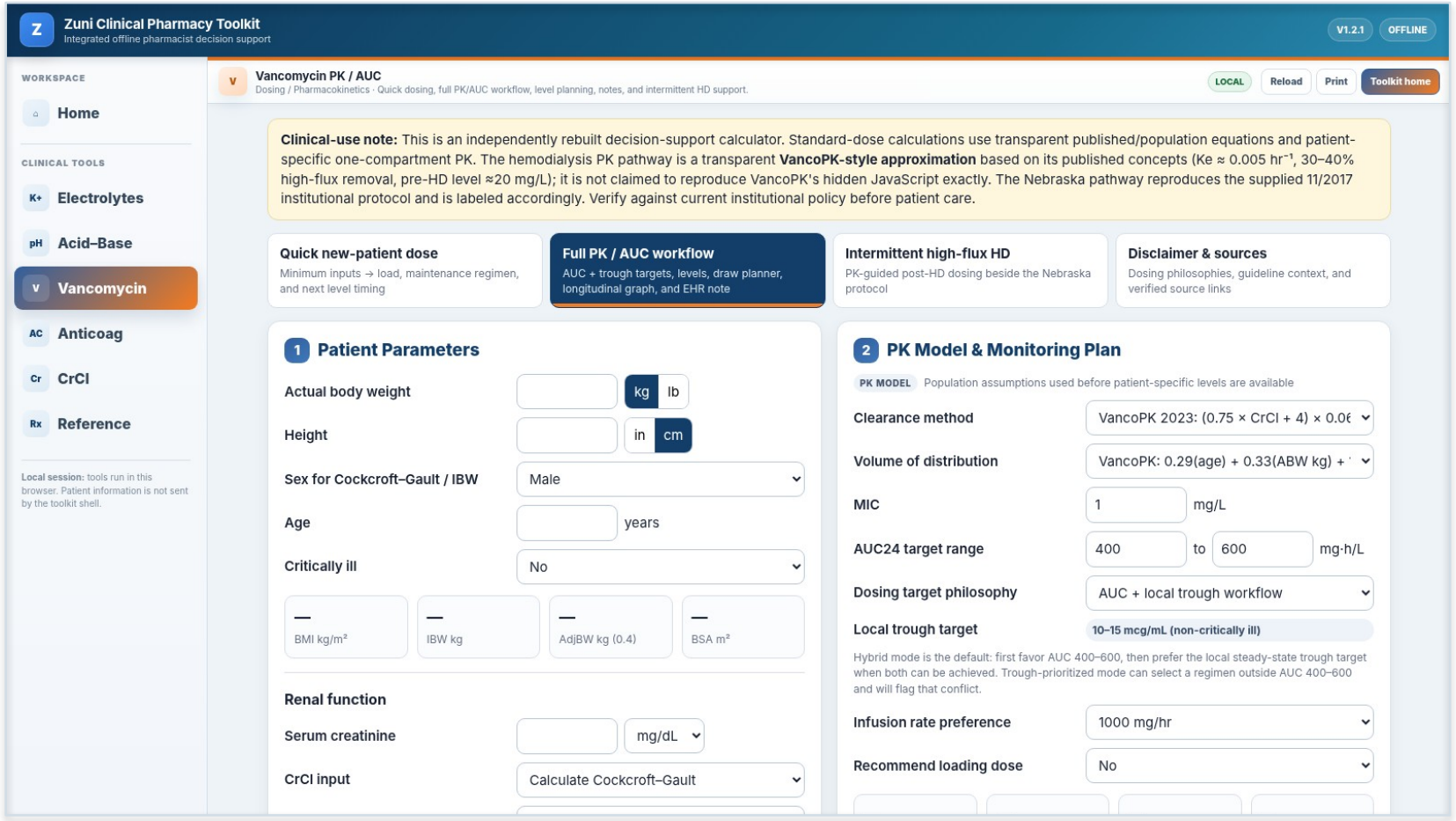
IV prep, rates, BUD & dose adjustment

Use the module that answers the immediate clinical question; each module keeps its own workflow while sharing the same ZSURx navigation.

3

Inside a module

The shell stays consistent even when each tool has its own workflow.

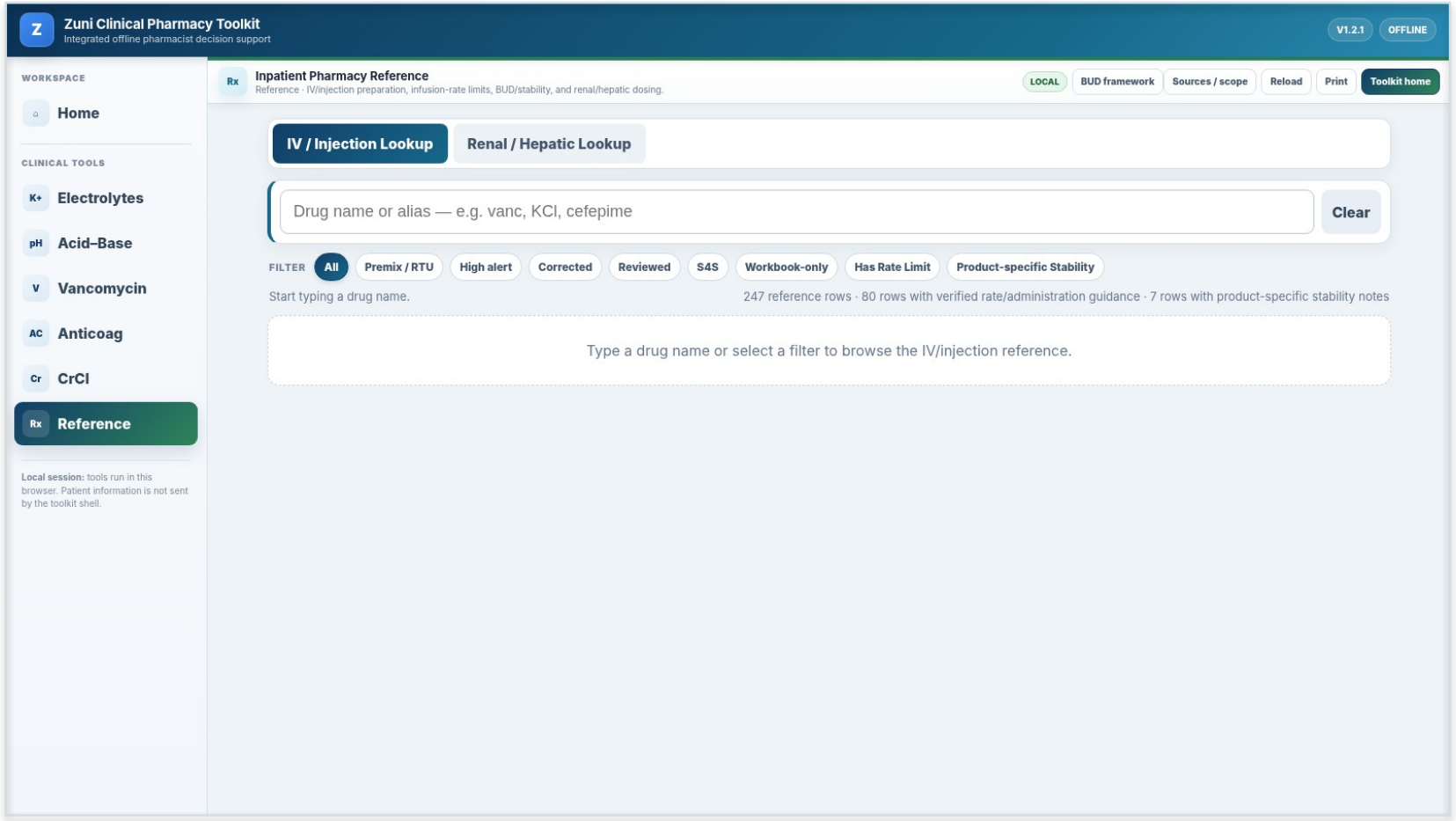


1. **The active module is highlighted in the left navigation.**
2. **The module toolbar identifies the tool and its clinical purpose.**
3. **Module-specific tabs, inputs, and results appear in the main workspace.**

Color is used for orientation and emphasis. Always read the accompanying label or clinical text—do not rely on color alone.

4 Know the persistent controls

These controls behave the same way across modules.



1. **LOCAL — confirms the toolkit is operating as a local session.**
2. **Reload — resets/reloads the current module.**
3. **Print — opens the browser print workflow when supported.**
4. **Toolkit home — returns to the ZSURx dashboard.**

Some modules also expose module-specific controls in this toolbar.

5

Use ZSURx as clinical decision support

The toolkit is designed to make common pharmacist workflows faster and easier to review.

Good workflow

1. Select the appropriate module.
2. Enter or review the required patient/clinical information.
3. Review the calculated recommendation and any warnings.
4. Apply clinical judgment and verify against the patient's situation.
5. Use the module's notes/sources when additional context is needed.

Clinical-use reminder

ZSURx is pharmacist decision-support software, not a substitute for patient-specific assessment, current institutional policy, or independent verification when the clinical situation requires it.

Use fictitious or appropriately handled patient information during training.

Next: module-specific tutorials

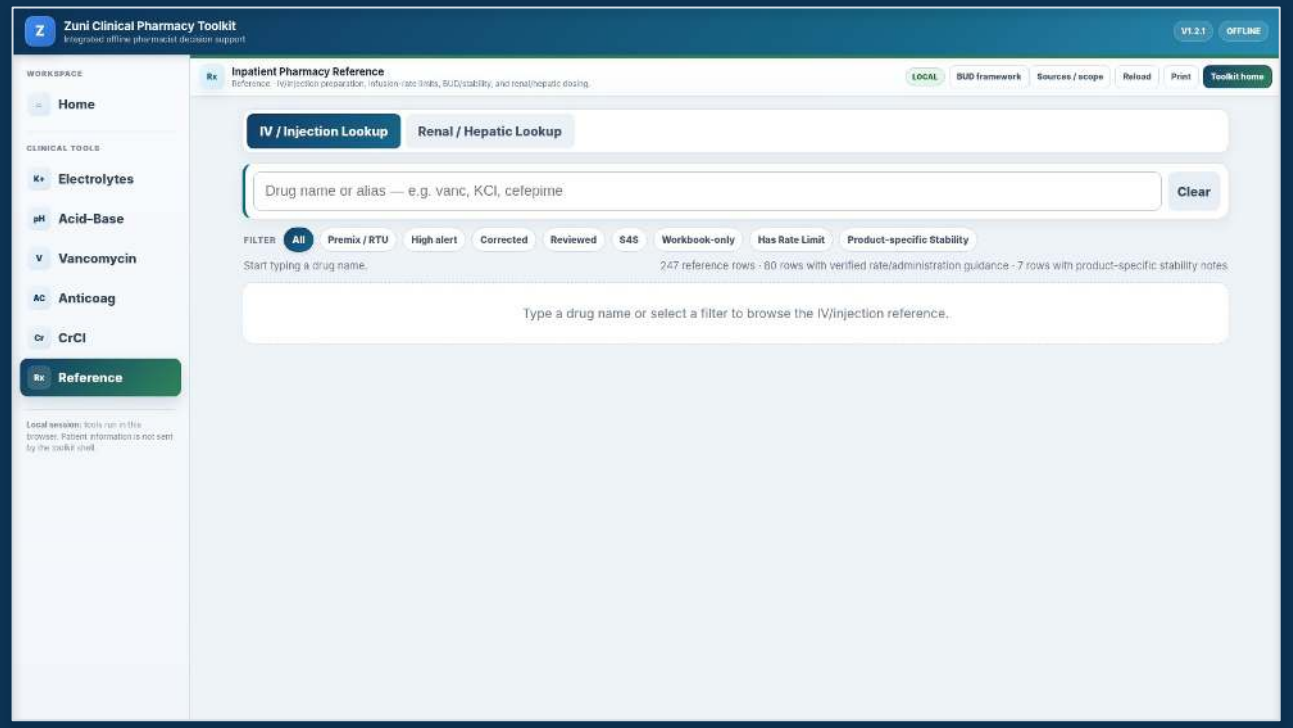
ZSURx • MODULE TUTORIAL

Inpatient Pharmacy Reference

IV preparation • infusion guidance • BUD/stability • renal/hepatic dosing

Goal

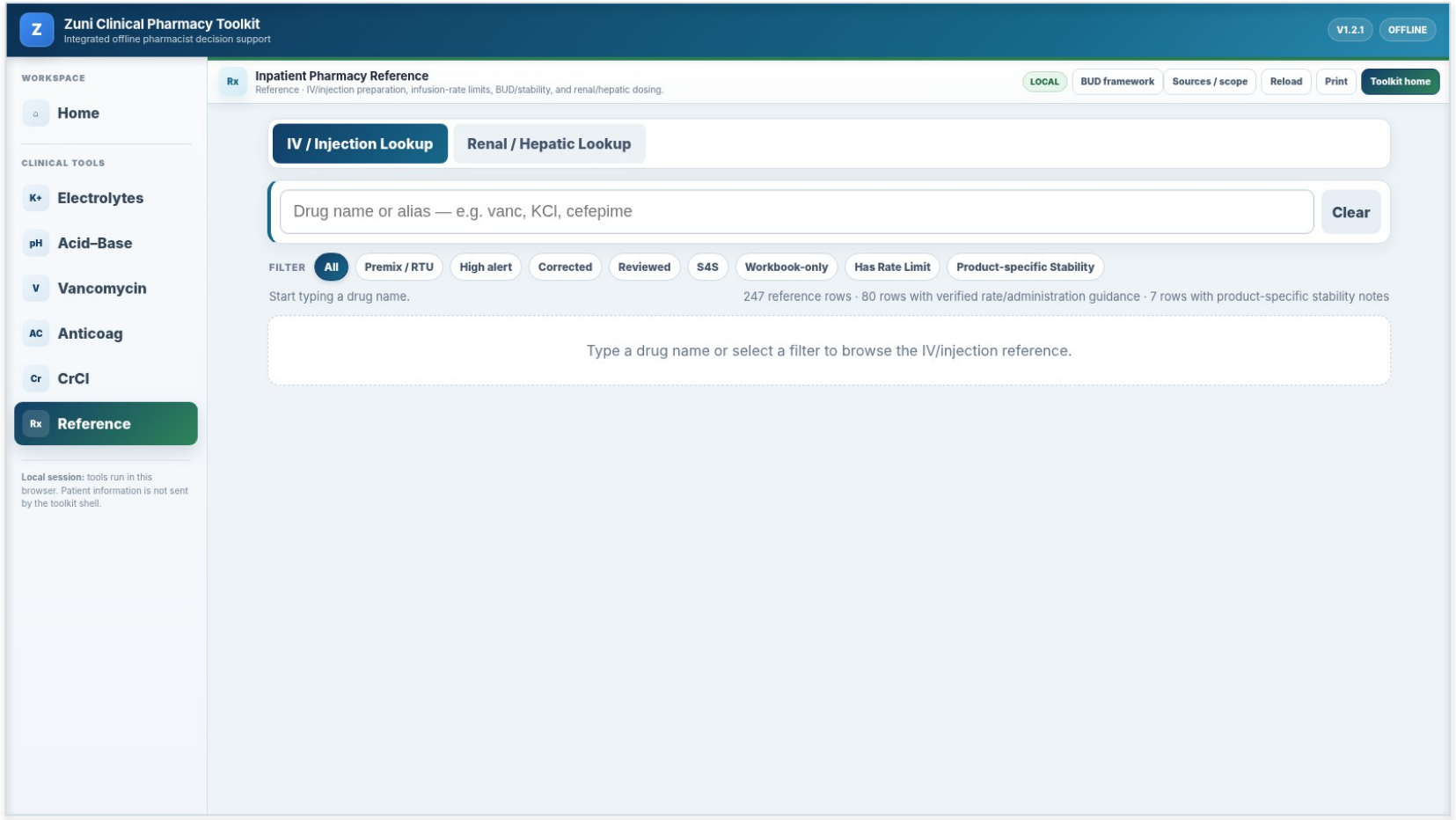
Find the information you need quickly, understand what each field means, and know when to open the supporting framework or source information.



1

Open Inpatient Reference

Use the Reference module for medication preparation and organ-adjustment lookups.



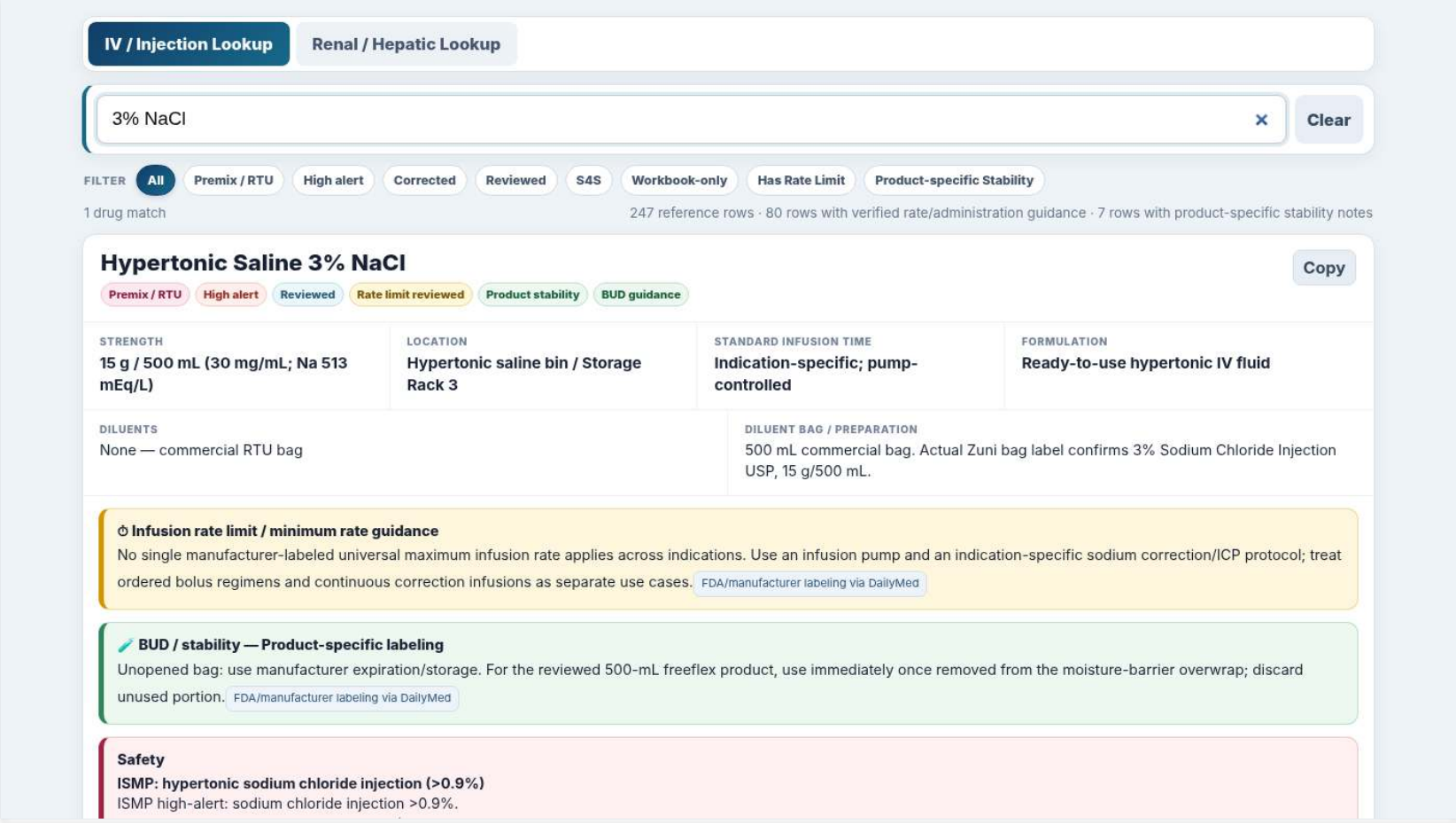
1. **Select Reference from the left navigation.**
2. **The default workspace opens to IV / Injection Lookup.**
3. **BUD Framework and Sources / Scope stay available in the module toolbar.**

The Reference module contains two related tools: IV/injection preparation guidance and renal/hepatic dose-adjustment guidance.

2

Search the way you actually think

The lookup accepts drug names and common aliases instead of requiring one exact naming convention.



1 **Click the search field and begin typing the medication.**

2 Common aliases are supported—for example: vanc, KCl, cefepime, 3% NaCl.

3 **Use the filters when you want to browse a category instead of a specific drug.**

Example search

3% NaCl → Hypertonic Saline 3% NaCl

3

Read the result from top to bottom

The result is designed as a quick preparation-and-administration reference.

Medication / strength

FORMULATION	LOCATION	DILUENTS
IV / injection	Where stocked	Compatible diluent(s)

STANDARD INFUSION	**Time / administration method**
RATE LIMIT	**Verified limit when available**
BUD / STABILITY	**Product-specific note or USP framework**

1. **Confirm you selected the intended strength/formulation.**
2. **Check diluent and preparation volume information.**
3. **Review standard infusion time and any verified rate limit.**
4. **Read BUD/stability separately; they are not interchangeable.**

4

Use filters as shortcuts

Filters help you find higher-risk or specially reviewed entries without knowing the drug name.

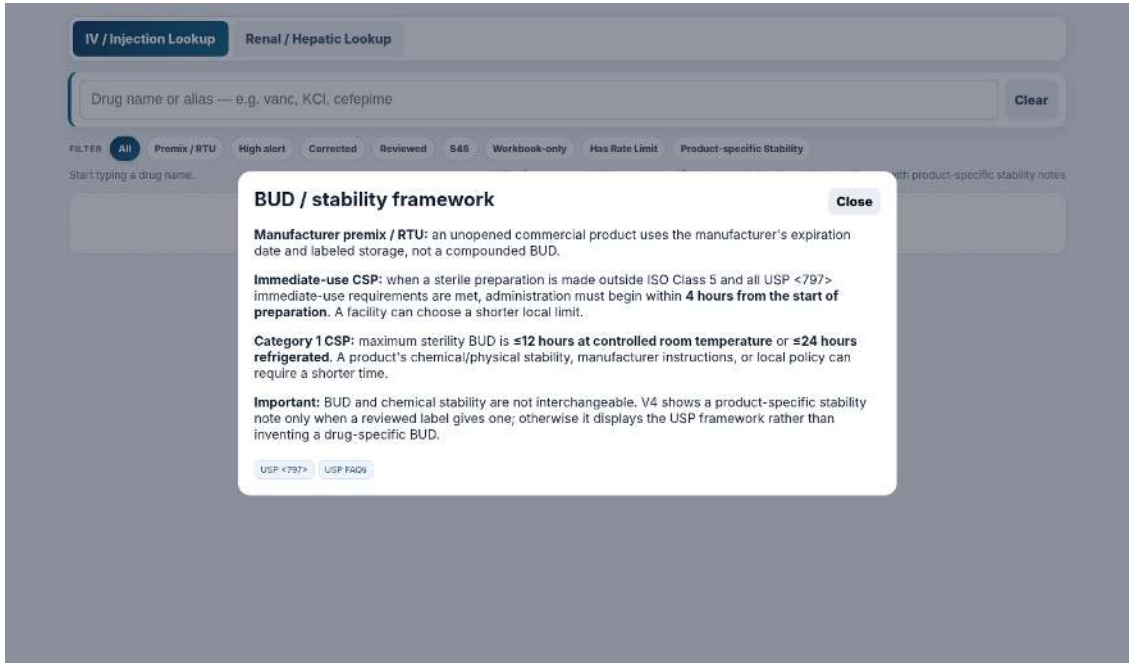
Premix / RTU	**Commercial ready-to-use products**
High alert	**Quickly surface high-alert entries**
Corrected	**Workbook information that was corrected**
Reviewed	**Entries with additional review**
Has Rate Limit	**Rows with verified administration/rate guidance**
Product-specific Stability	**Rows with reviewed product-specific stability**

A blank rate-limit field does not mean rapid administration is safe. It means the tool does not display a verified rate limit for that row.

5

Understand BUD versus stability

Use the BUD Framework when the preparation does not have a product-specific stability note.



This is the actual BUD Framework view coworkers will see after selecting BUD Framework in the module toolbar.

Key distinction

BUD and chemical/physical stability answer different questions. ZSURx only displays a product-specific stability note when a reviewed source supports one.

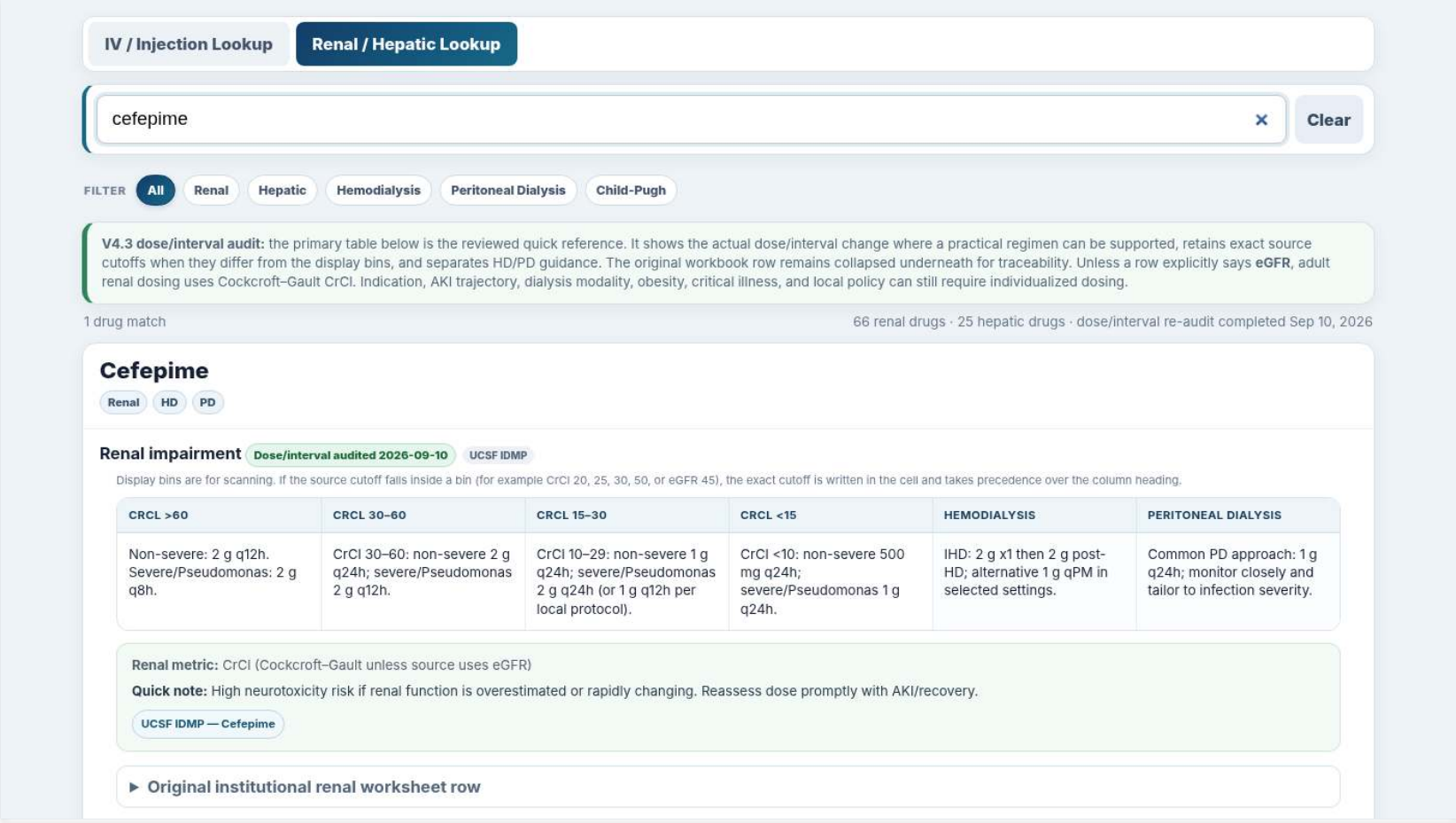
When in doubt:

Open BUD Framework → read the displayed medication note → follow the shorter applicable manufacturer, stability, USP, or local-policy limit.

6

Switch to Renal / Hepatic Lookup

Use the second mode when the question is dose or interval adjustment rather than IV preparation.



1. **Select Renal / Hepatic Lookup at the top of the module.**
2. **Search by drug name or alias.**
3. **Filter by Renal, Hepatic, Hemodialysis, Peritoneal Dialysis, or Child-Pugh.**

Unless a row explicitly says eGFR, the adult renal-dosing reference uses Cockcroft–Gault CrCl. Exact source cutoffs may differ from simplified display bins.

7

Use the adjustment table as a quick reference

The table gives the practical adjustment while retaining source-specific details for traceability.

Example workflow: cefepime

1. Determine the patient’s renal function using the appropriate method.
2. Search cefepime in Renal / Hepatic Lookup.
3. Match the patient to the applicable renal-function range.
4. Read the displayed dose / interval adjustment.
5. Check HD/PD guidance separately when dialysis applies.
6. Expand source/original information when the exact cutoff matters.

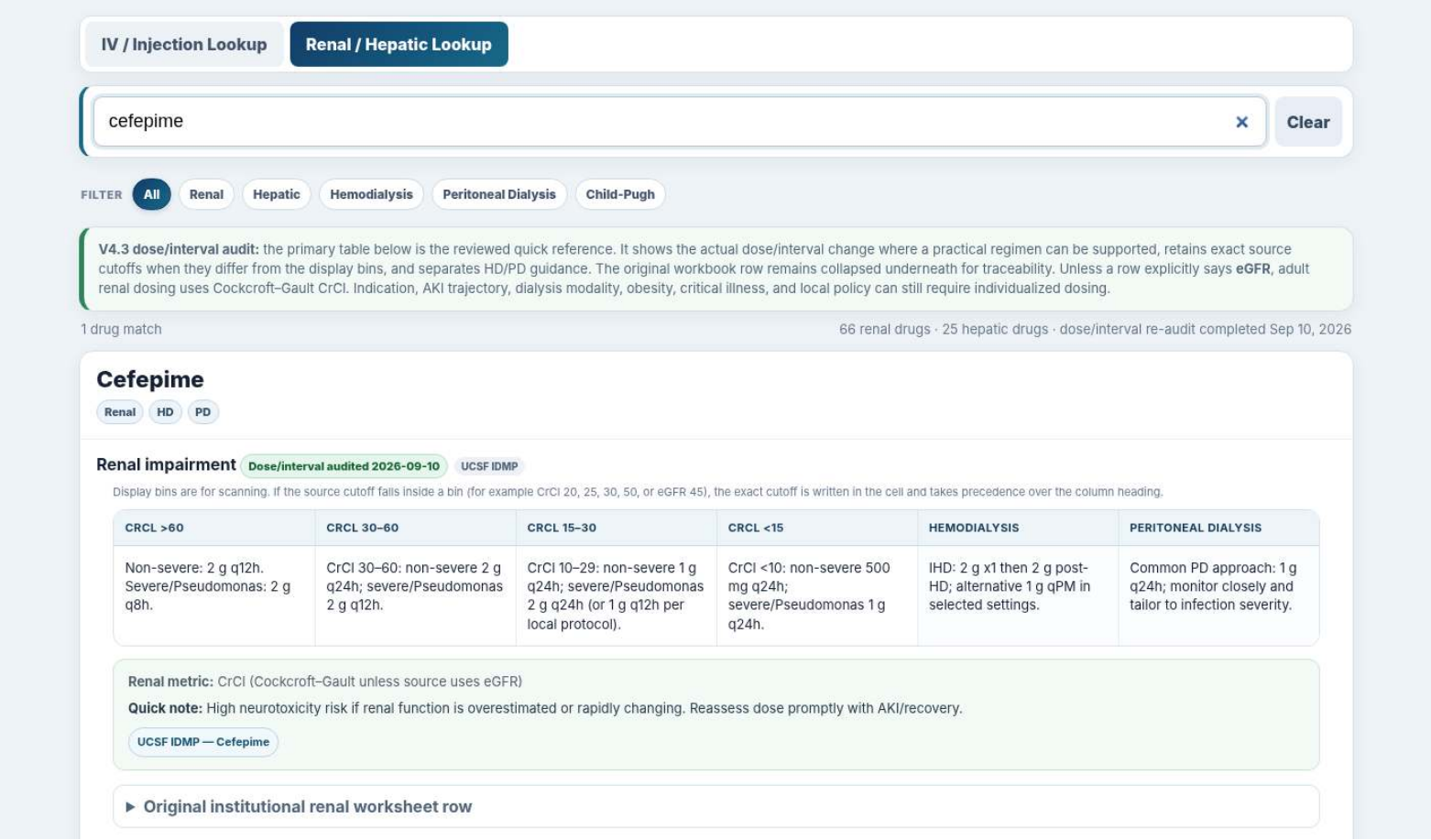
Individualize when needed

The module itself notes that indication, AKI trajectory, dialysis modality, obesity, critical illness, and local policy can require individualized dosing.

Use the table as decision support—not as a substitute for those clinical factors.

8A Read renal recommendations correctly

The table is designed for rapid scanning, but the exact text inside the cell takes precedence over the display-bin heading.



1

Start with the renal metric

Unless the row explicitly says eGFR, the tool uses Cockcroft–Gault CrCl.

2

Use the exact cutoff

The column headings are scanning bins. If a source cutoff falls inside a bin, the exact cutoff written in the cell is the one to follow.

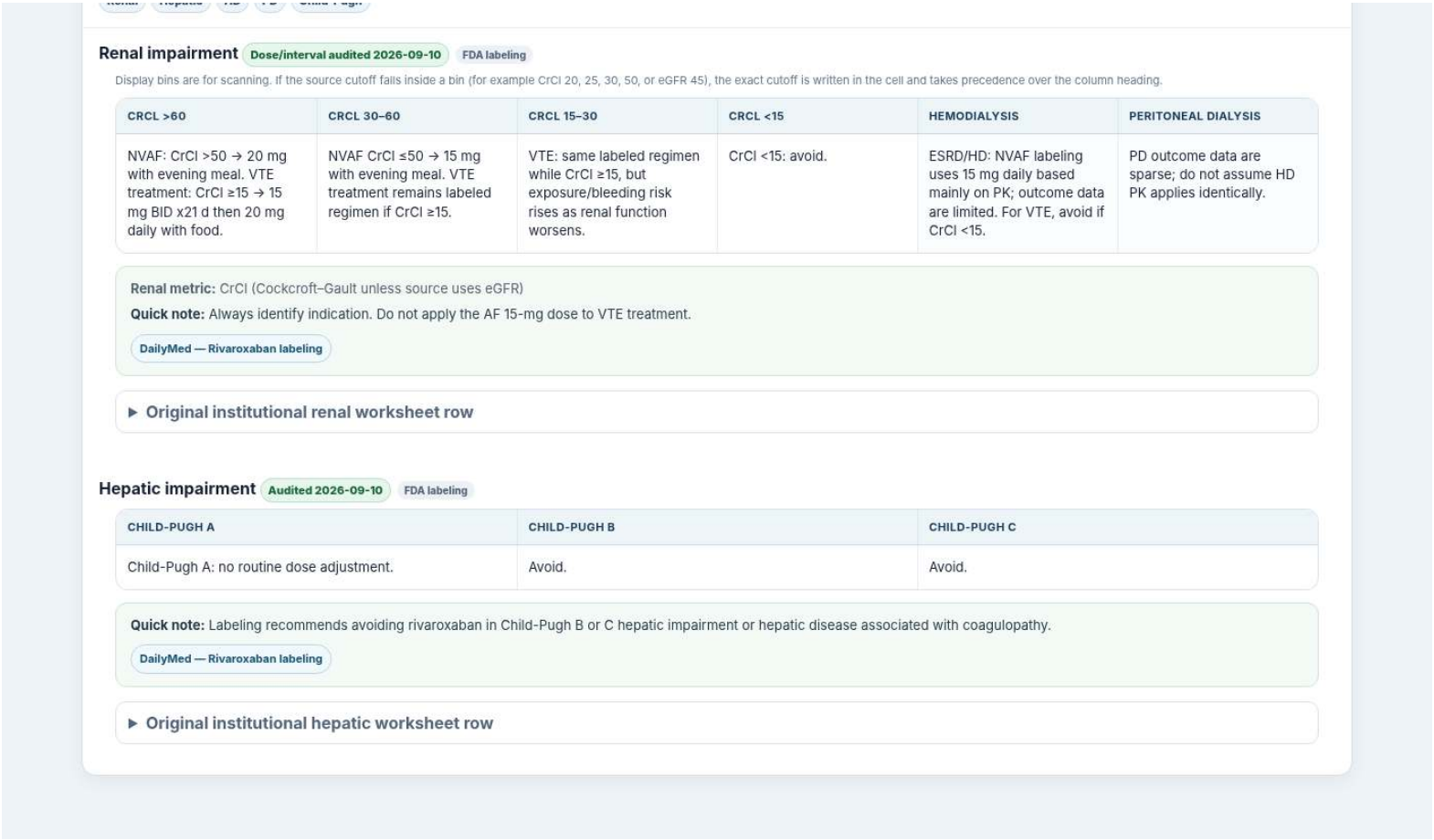
3

Then individualize

Indication, AKI trajectory, obesity, critical illness, dialysis modality, and local policy can change the appropriate regimen.

8B Review hepatic adjustment guidance

Hepatic recommendations are presented separately using Child-Pugh categories when the reviewed source supports that framework.



Renal impairment Dose/interval audited 2026-09-10 FDA labeling

Display bins are for scanning. If the source cutoff falls inside a bin (for example CrCl 20, 25, 30, 50, or eGFR 45), the exact cutoff is written in the cell and takes precedence over the column heading.

CRCL >60	CRCL 30–60	CRCL 15–30	CRCL <15	HEMODIALYSIS	PERITONEAL DIALYSIS
NVAF: CrCl >50 → 20 mg with evening meal. VTE treatment: CrCl ≥15 → 15 mg BID x21 d then 20 mg daily with food.	NVAF CrCl ≤50 → 15 mg with evening meal. VTE treatment remains labeled regimen if CrCl ≥15.	VTE: same labeled regimen while CrCl ≥15, but exposure/bleeding risk rises as renal function worsens.	CrCl <15: avoid.	ESRD/HD: NVAF labeling uses 15 mg daily based mainly on PK; outcome data are limited. For VTE, avoid if CrCl <15.	PD outcome data are sparse; do not assume HD PK applies identically.

Renal metric: CrCl (Cockcroft–Gault unless source uses eGFR)

Quick note: Always identify indication. Do not apply the AF 15-mg dose to VTE treatment.

DailyMed — Rivaroxaban labeling

▶ Original institutional renal worksheet row

Hepatic impairment Audited 2026-09-10 FDA labeling

CHILD-PUGH A	CHILD-PUGH B	CHILD-PUGH C
Child-Pugh A: no routine dose adjustment.	Avoid.	Avoid.

Quick note: Labeling recommends avoiding rivaroxaban in Child-Pugh B or C hepatic impairment or hepatic disease associated with coagulopathy.

DailyMed — Rivaroxaban labeling

▶ Original institutional hepatic worksheet row

1

Find the hepatic section

A drug may have both renal and hepatic guidance. Scroll within the result to the Hepatic impairment table.

2

Read across Child-Pugh A/B/C

For this rendered rivaroxaban example, the reviewed table shows no routine adjustment in A and avoidance in B or C.

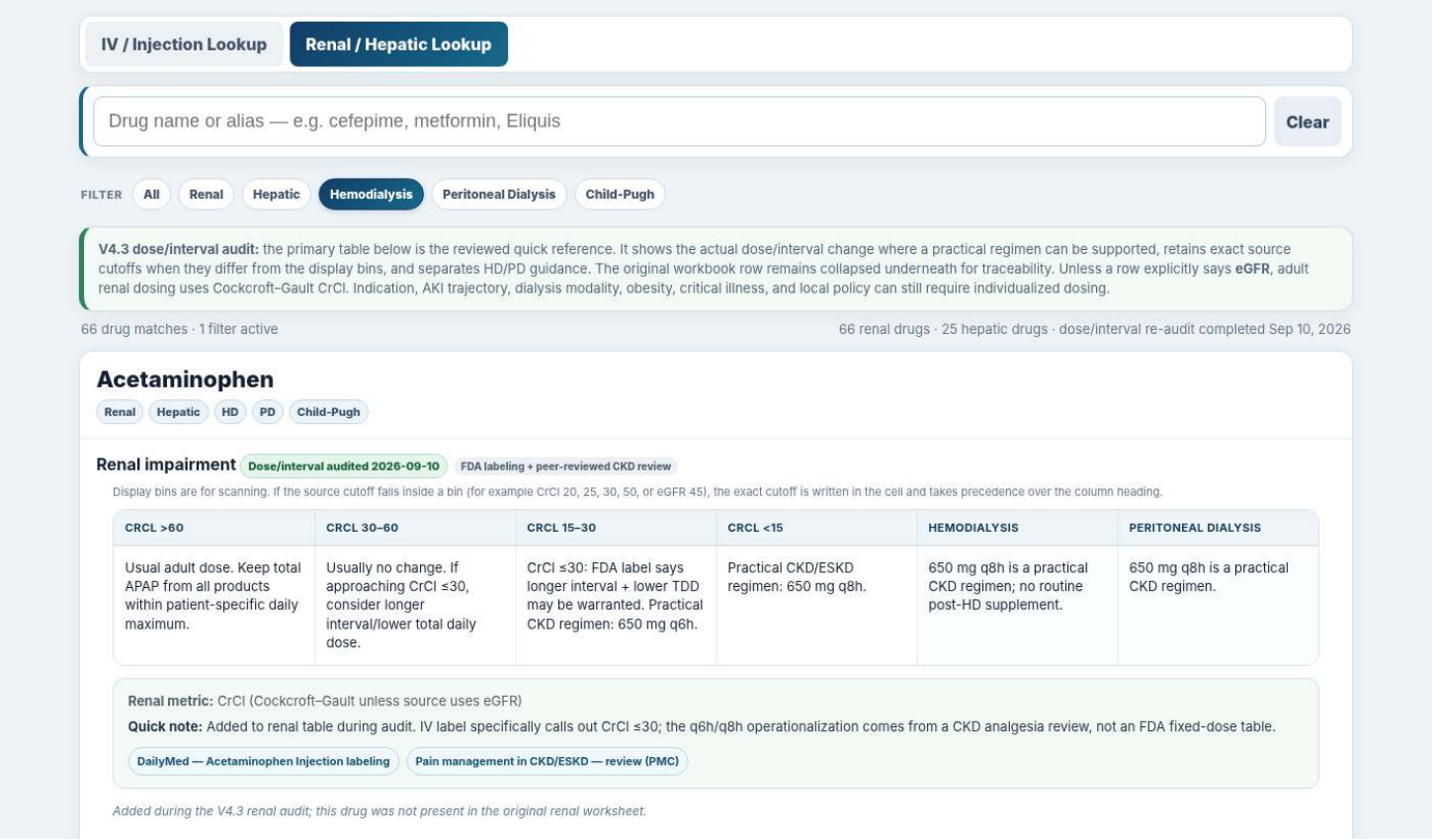
3

Read the Quick note

The note preserves clinically important qualifiers—in this example, hepatic disease associated with coagulopathy is also addressed.

8C Use dialysis and Child-Pugh filters to browse

You do not need to know the exact drug name first. Filters can narrow the audited reference to the type of adjustment you need.



1

Hemodialysis

Select Hemodialysis to browse drugs with reviewed HD guidance.

2

Peritoneal Dialysis

PD is kept separate; the tool does not assume HD pharmacokinetics apply identically to PD.

3

Child-Pugh

Use Child-Pugh to browse drugs with hepatic impairment guidance, then open the individual result for A/B/C recommendations.

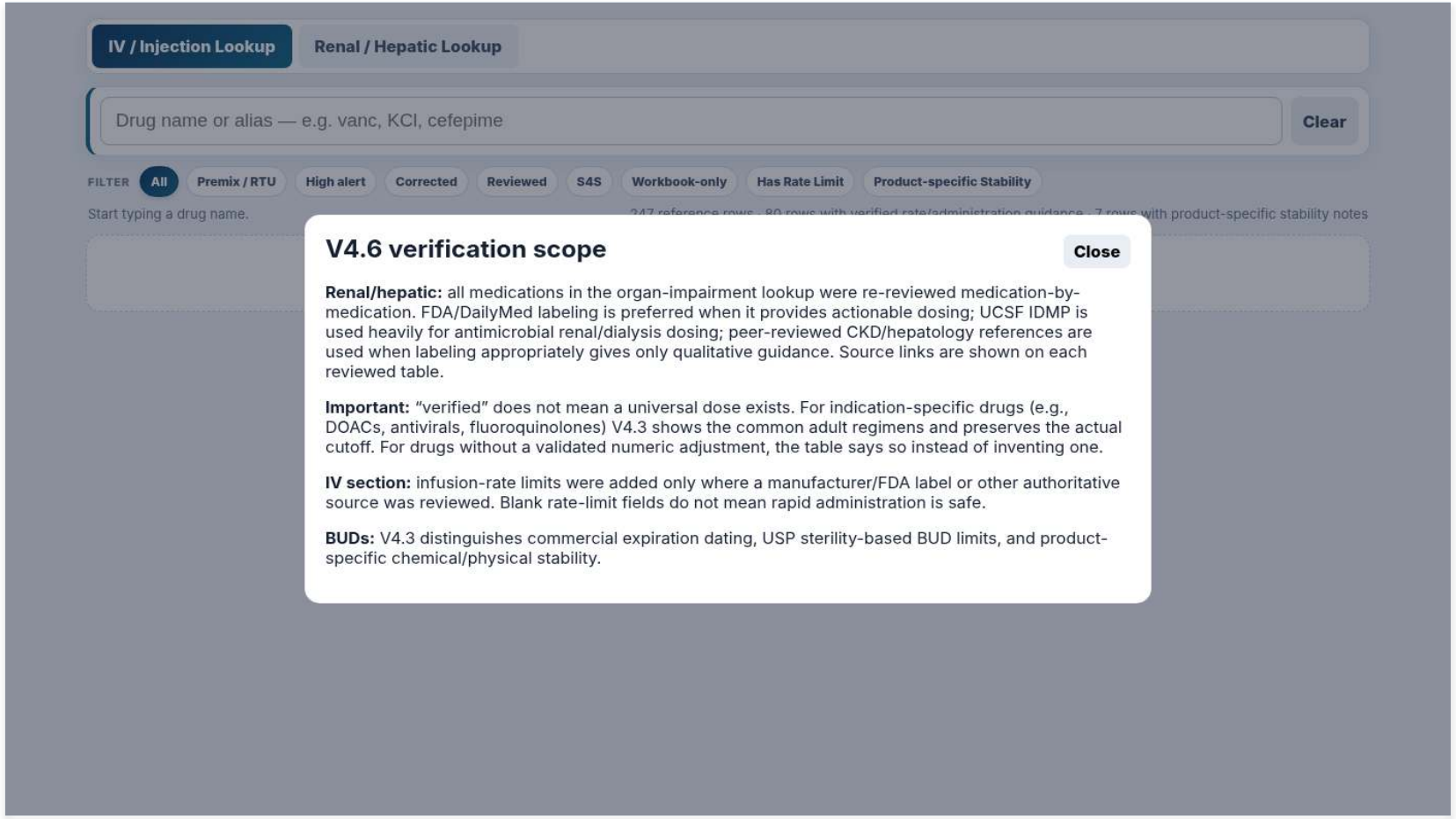
Traceability: reviewed tables retain the original institutional worksheet row collapsed underneath. Expand it when you need to compare the current audited guidance with the source workbook entry.

The organ-impairment lookup reports 66 renal drugs and 25 hepatic drugs in this V1.2.1 build.

8

Know what has—and has not—been verified

The Sources / Scope control explains the review status behind the reference.



1. **Open Sources / Scope when you need the verification boundaries.**
2. **Review-status labels distinguish workbook-only, corrected, and reviewed information.**
3. **Use linked sources when a patient-specific decision requires deeper verification.**

For time-sensitive or high-risk decisions, confirm that the displayed guidance fits the patient and current local policy.

Inpatient Reference: the 30-second workflow

1 → 2 → 3 → 4 → 5

Choose

IV / Injection or Renal / Hepatic

Search

Drug name or common alias

Read

Strength → prep → administration → BUD

Verify

Warnings, adjustment range, source/scope

Apply

Patient-specific clinical judgment

ZSURx supports the lookup. The pharmacist still owns the clinical decision.

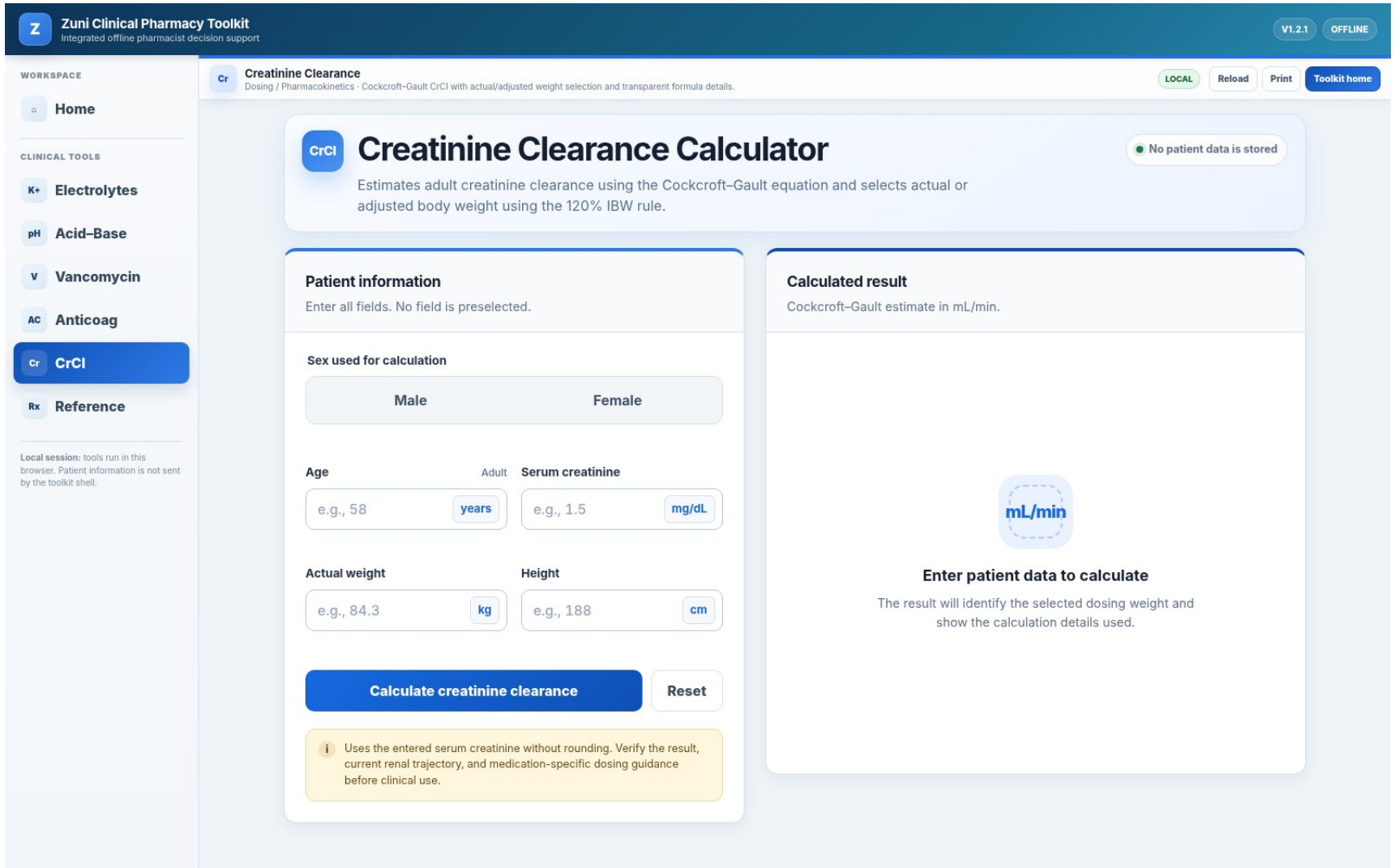
Creatinine Clearance Calculator

Comprehensive ZSURx Tutorial

Calculate Cockcroft-Gault CrCl, understand the calculator's 120% IBW weight-selection rule, and verify exactly which weight was used.

Training case: 68-year-old male • 105 kg • 175 cm • SCr 1.6 mg/dL

Open CrCl from the toolkit and orient to the two-panel workflow



1 Patient information

Sex, age, serum creatinine, actual weight, and height are all required. No field is preselected.

2 Calculated result

The right panel stays empty until the required data pass validation.

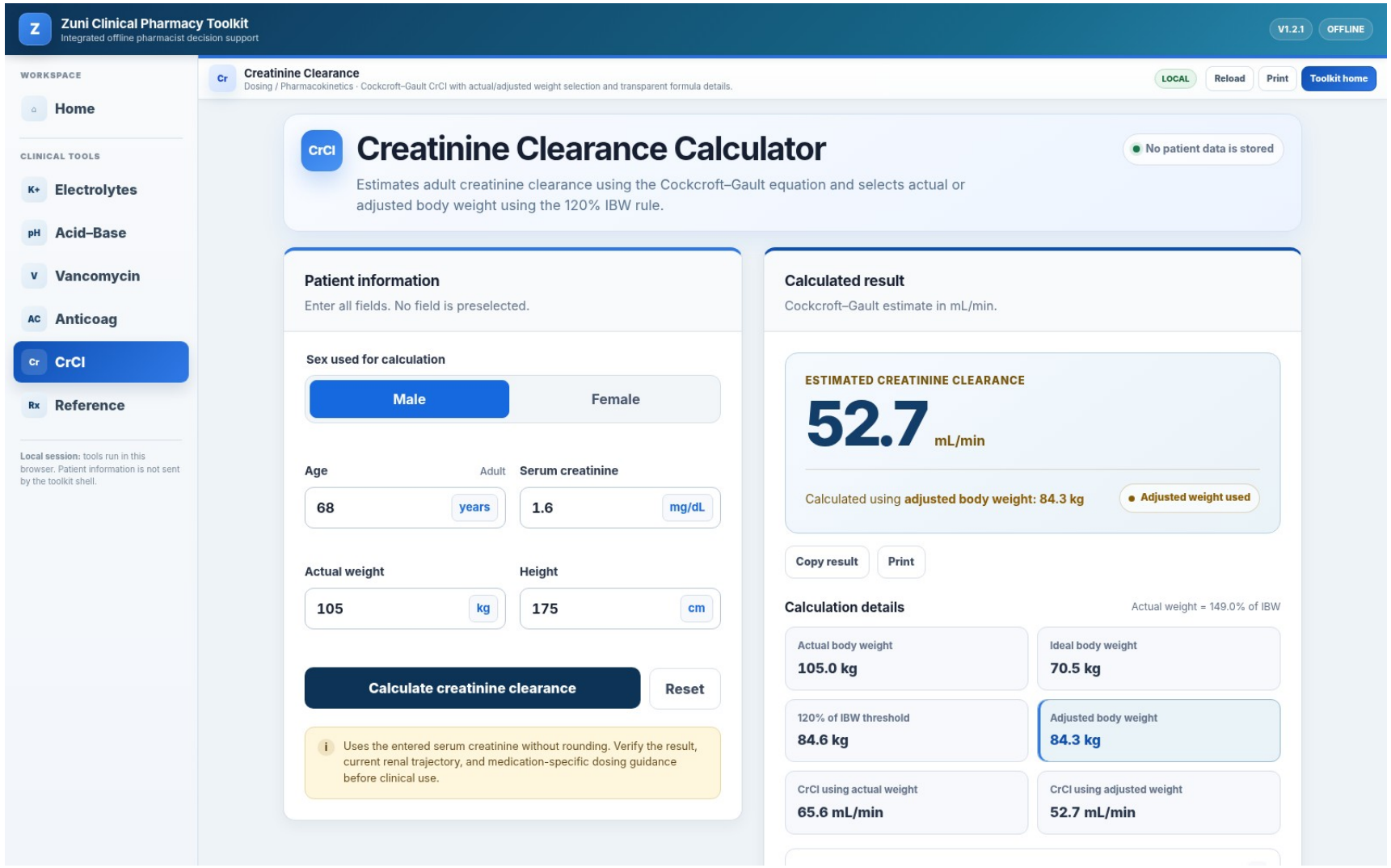
3 Local session

The module states that calculations occur locally and patient data are not stored by the calculator.

4 Purpose

This module estimates adult Cockcroft-Gault creatinine clearance; it is not the laboratory-reported eGFR.

Enter the patient exactly as measured



1 Select sex

The selected sex affects both Devine IBW and, for female calculations, the Cockcroft-Gault 0.85 factor.

2 Enter current SCr

The tool uses the serum creatinine exactly as entered; it does not round SCr upward.

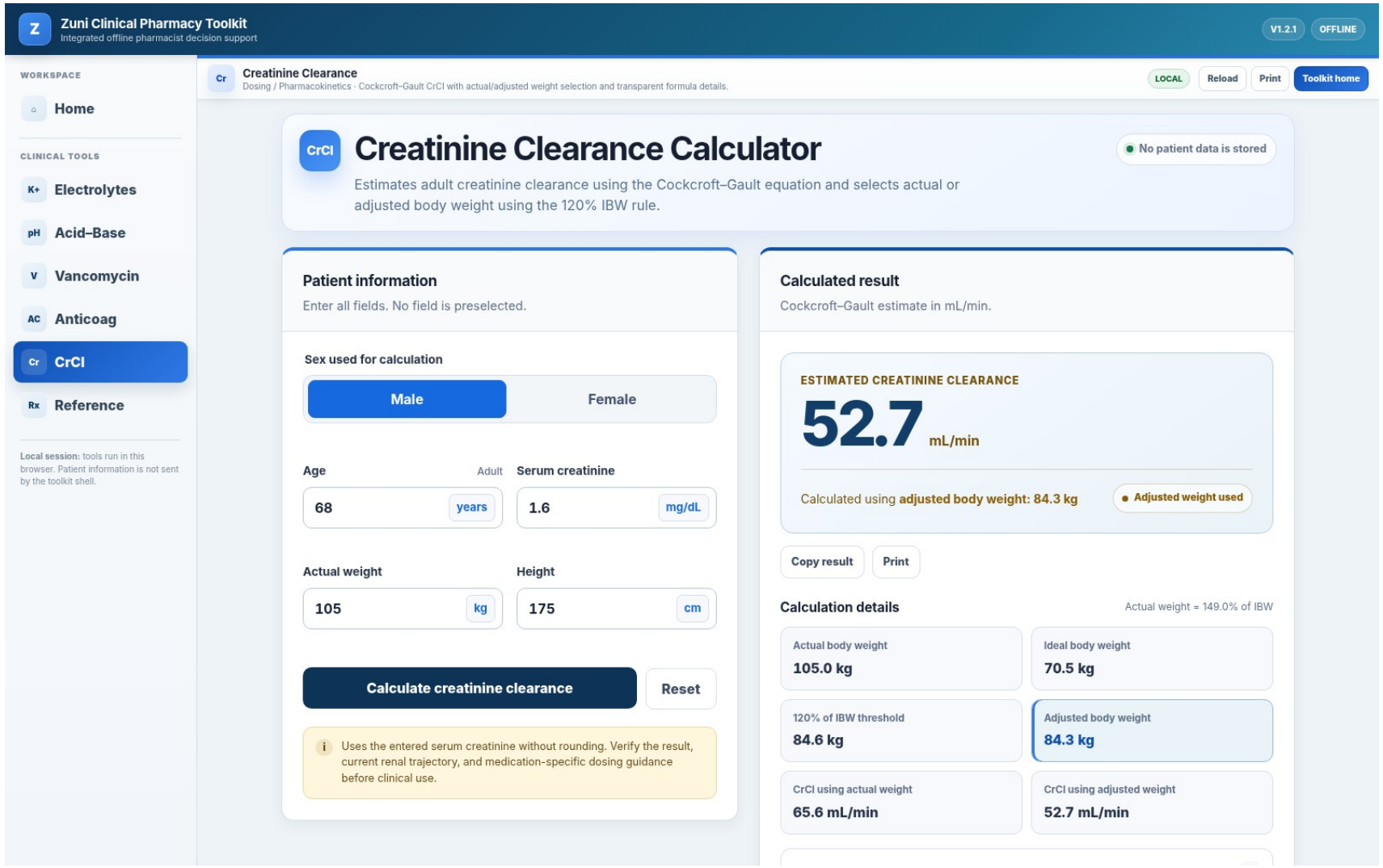
3 Use actual body weight

Enter the patient's measured weight. The calculator decides whether actual or adjusted weight is used in CrCl.

4 Height drives IBW

Height is required because the 120% IBW rule determines the dosing weight.

The calculator automatically selects actual or adjusted body weight



1

IBW = 70.5 kg

For this 175-cm male, the displayed Devine ideal body weight is 70.5 kg.

2

120% threshold = 84.6 kg

Actual weight is 105 kg, or 149% of IBW, so it exceeds the calculator's threshold.

3

Adjusted weight = 84.3 kg

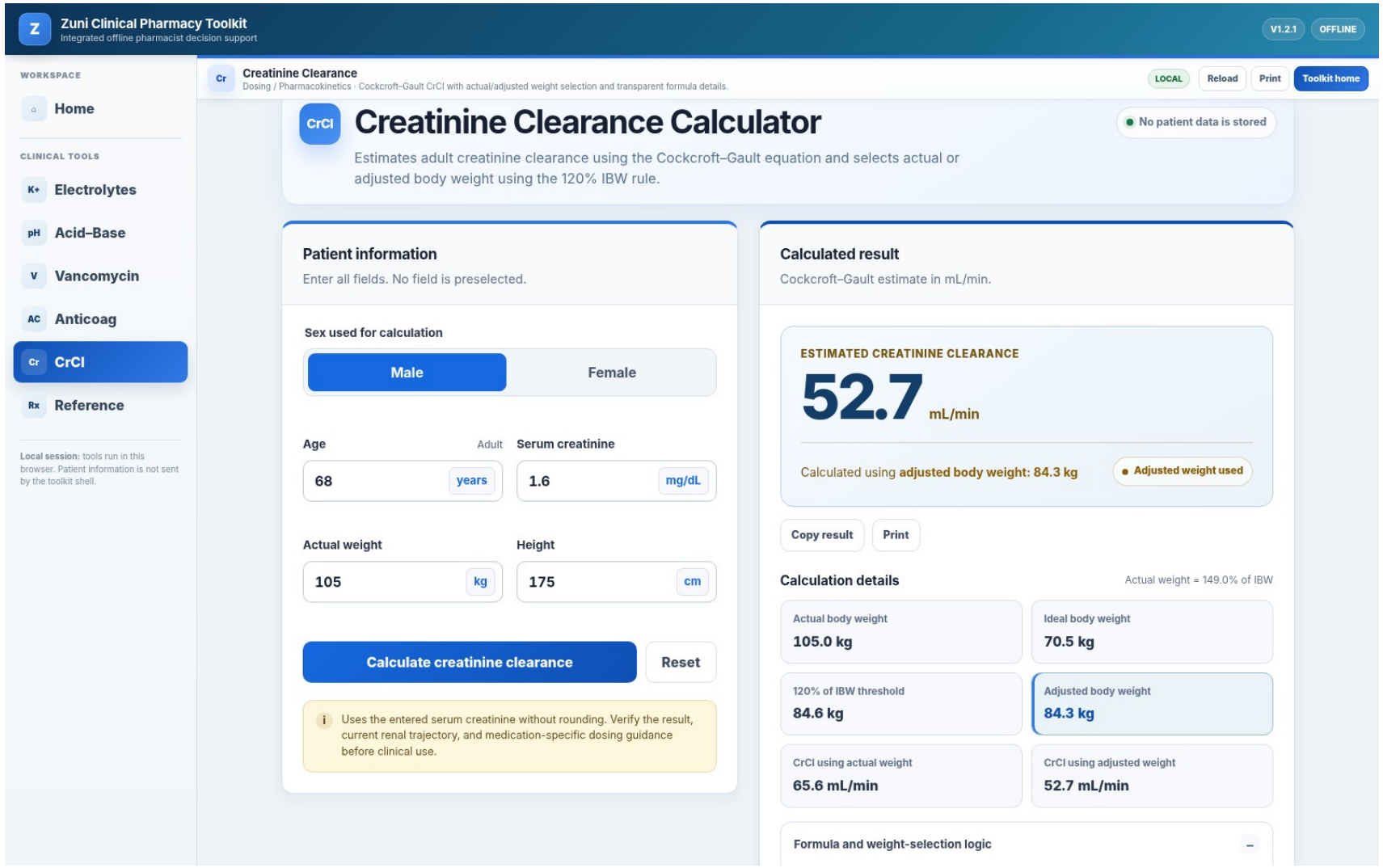
The tool calculates AdjBW = IBW + 0.4 × (actual - IBW) and selects it automatically.

4

Selected CrCl = 52.7 mL/min

The highlighted metric and result badge make the chosen dosing weight visible.

Use Calculation details to audit the weight decision



1 — Compare both estimates

The tool displays CrCl using actual weight and CrCl using adjusted weight side-by-side.

2 — Selected metric is highlighted

For this case, adjusted-weight CrCl 52.7 mL/min is selected; actual-weight CrCl would be 65.6 mL/min.

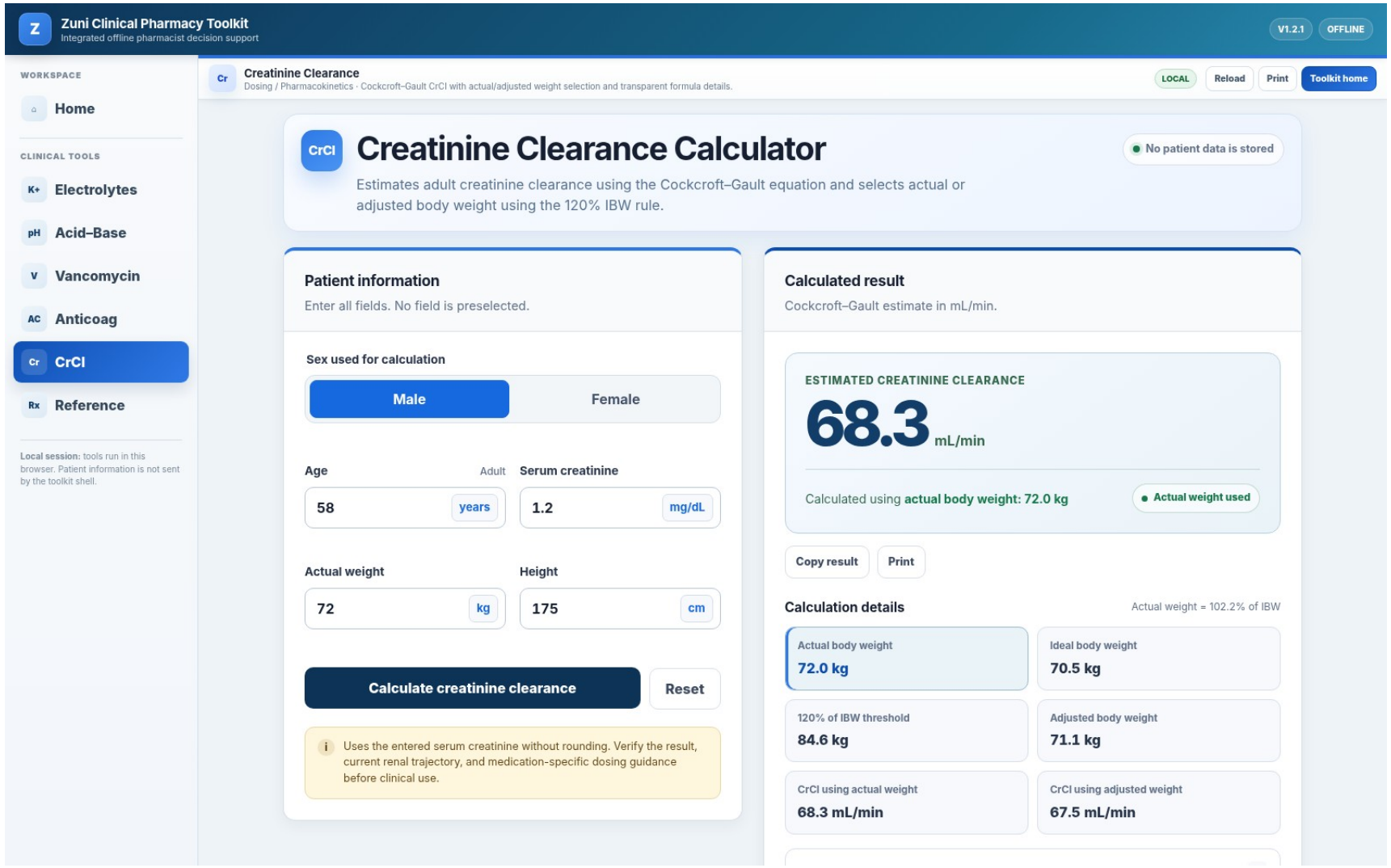
3 — Expand the formula

Formula and weight-selection logic shows the IBW equation and the complete Cockcroft-Gault substitution.

4 — Do not infer silently

If the weight choice matters to a dosing decision, confirm the displayed selected weight rather than assuming which weight the calculator used.

When actual weight is ≤120% of IBW, the tool uses actual body weight



1 — Second training case

58-year-old male • 72 kg • 175 cm • SCr 1.2 mg/dL.

2 — Actual weight is below threshold

IBW is about 70.5 kg and 120% IBW is about 84.6 kg, so 72 kg qualifies for actual-weight use.

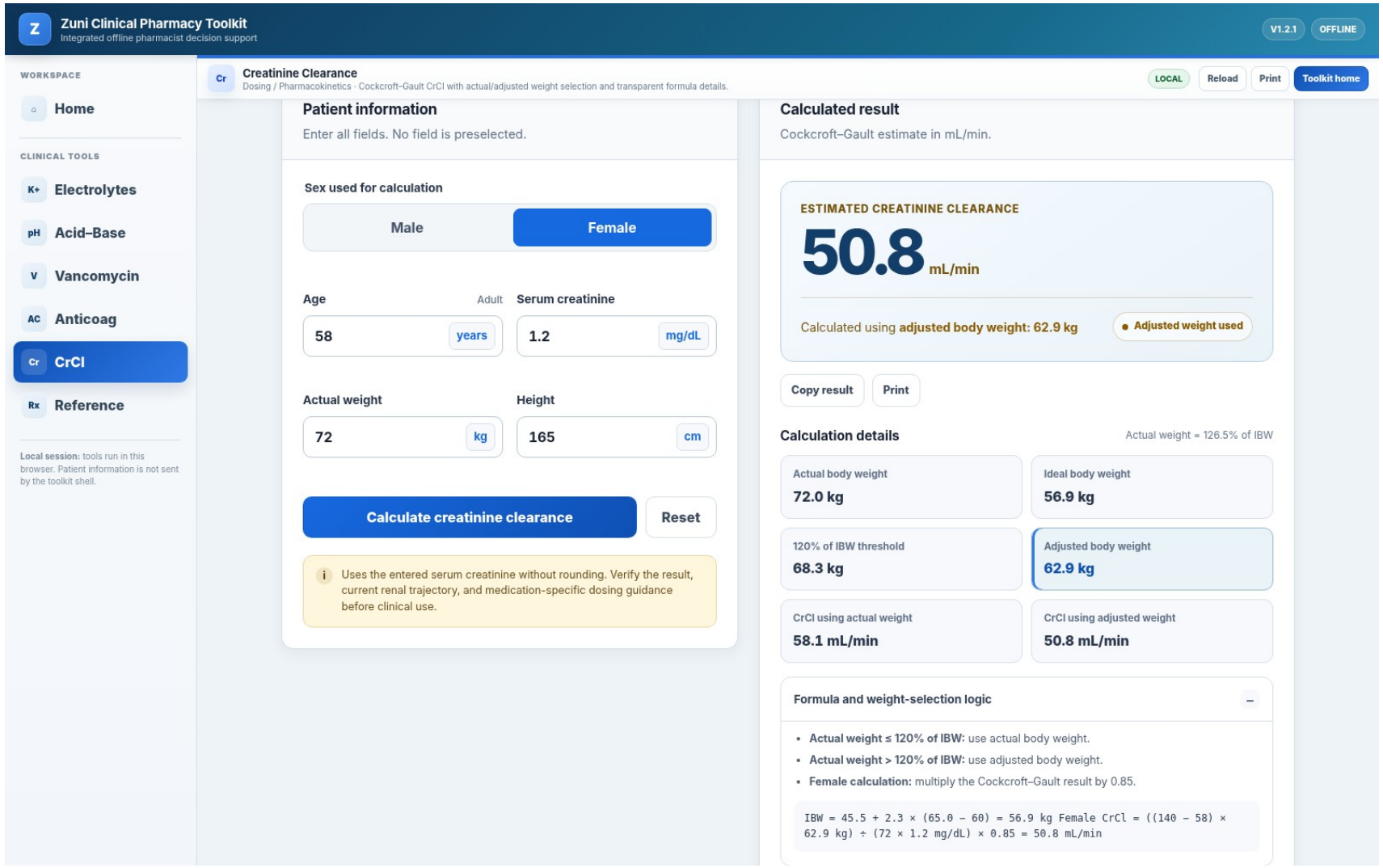
3 — CrCl = 68.3 mL/min

The result badge now explicitly says Actual weight used.

4 — Same workflow, different weight

The user does not manually toggle ABW vs AdjBW; the calculator applies its rule from the entered data.

Female calculations apply both sex-specific IBW and the 0.85 factor



1 — Female IBW equation

The formula panel uses IBW = 45.5 + 2.3 kg for each inch over 5 feet.

2 — Weight rule still applies

For this 58-year-old, 72-kg, 165-cm patient, actual weight exceeds 120% of IBW, so adjusted weight is selected.

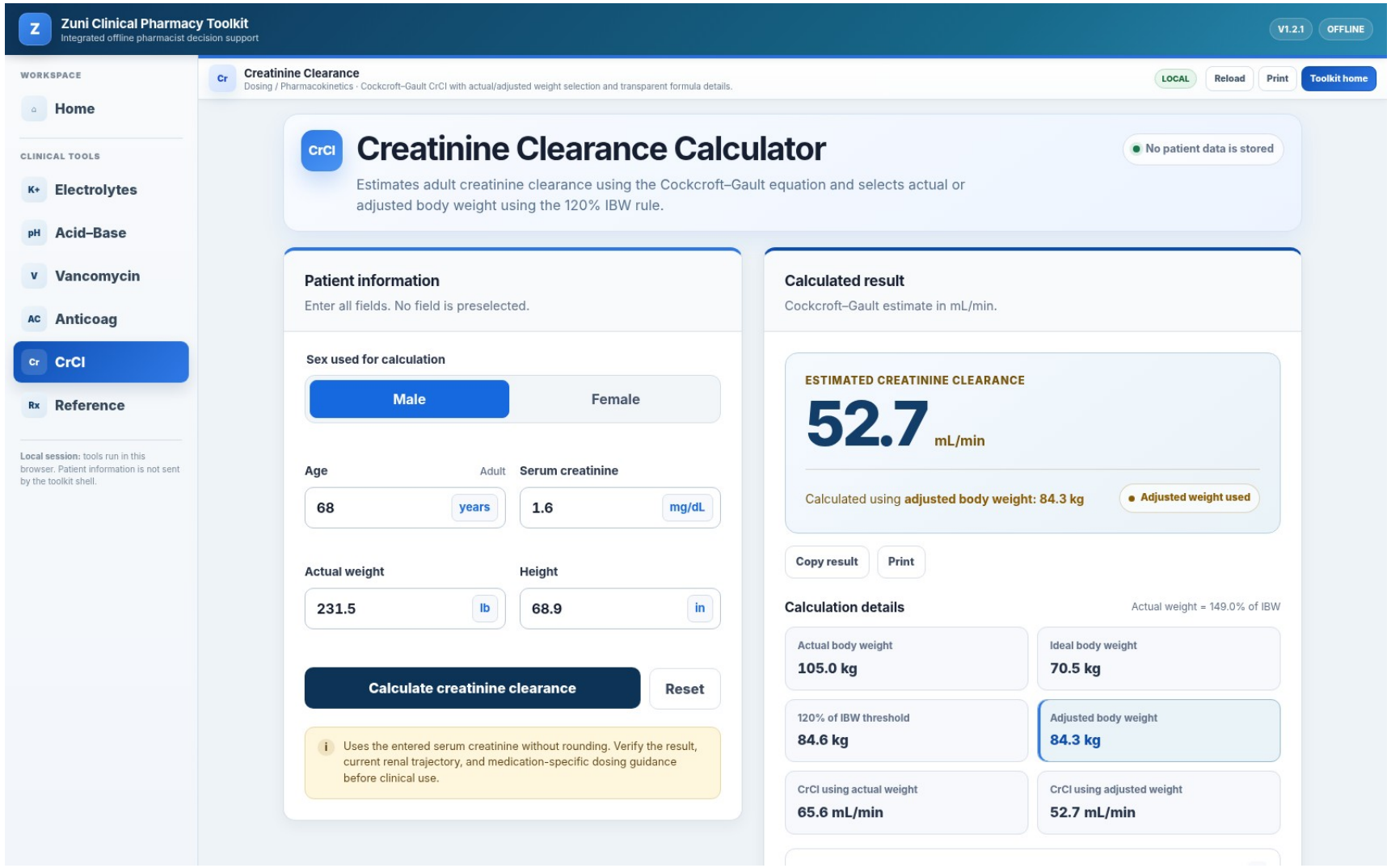
3 — Cockcroft-Gault × 0.85

The formula display makes the female correction visible rather than hiding it in the result.

4 — Result = 50.8 mL/min

The displayed result uses the selected adjusted weight and female factor.

Switch kg ↔ lb and cm ↔ in without changing the clinical result



1 — Unit labels are buttons

Click kg or cm to convert the displayed entry to lb or in.

2 — Values convert automatically

105 kg becomes about 231.5 lb and 175 cm becomes about 68.9 in.

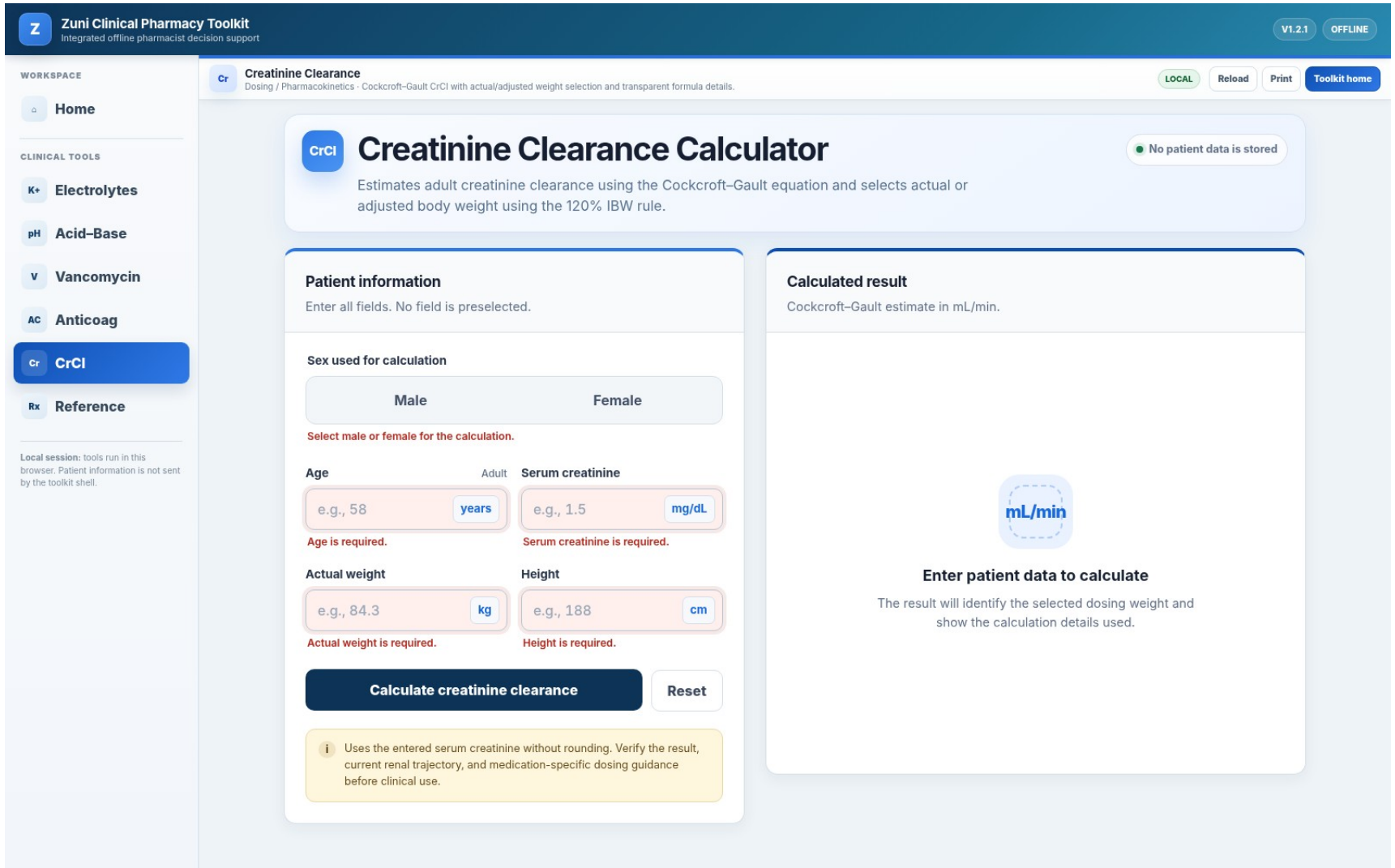
3 — Calculation normalizes units

The tool converts entries back to kg/cm internally before applying IBW and Cockcroft-Gault formulas.

4 — Result should remain unchanged

Unit switching is a convenience feature, not a different calculation method.

Input validation prevents an incomplete calculation



1 — No default sex

The user must deliberately select Male or Female before calculating.

2 — Required numeric fields

Age, SCr, weight, and height are checked for missing or out-of-range values.

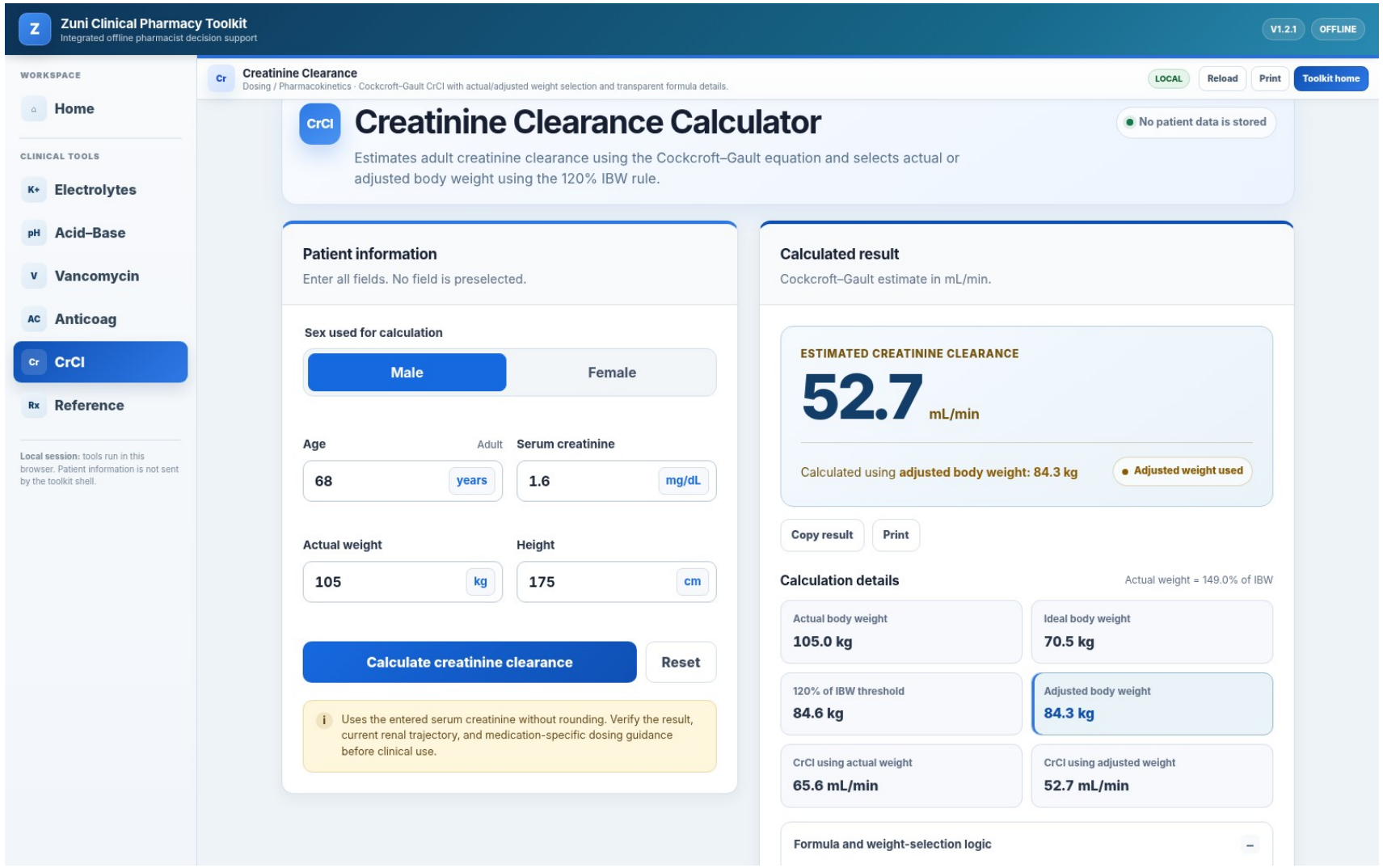
3 — Errors appear at the field

The calculator identifies which entry needs correction rather than generating a partial result.

4 — Reset clears the case

Reset returns units to kg/cm, clears validation, and removes the calculated result.

Copy, print, and formula details support handoff and verification



1 Copy result

After calculation, Copy result creates a text summary of the patient inputs, selected weight, CrCl, and weight details.

2 Print

The module provides a print action for a clean record/reference when needed.

3 Formula remains inspectable

Expand the formula whenever the result is unexpected or the selected weight needs to be explained.

4 CrCl, not eGFR

The result footnote explicitly distinguishes this Cockcroft-Gault estimate from laboratory-reported eGFR.

Interpret the number as calculation support, not an independent dosing recommendation

1

Check renal trajectory

The module itself instructs the user to verify the current renal trajectory before clinical use.

2

SCr is not rounded

The exact entered SCr is used. The calculator does not substitute a minimum creatinine value.

3

Medication guidance still controls

A CrCl estimate does not by itself determine a dose; apply the renal metric and cutoffs specified by the medication/protocol in use.

4

Know the built-in weight rule

This tool's rule is actual weight at ≤120% IBW and adjusted weight above 120% IBW.

5

Verify unusual patients

When body size, renal function, or the clinical situation makes Cockcroft-Gault assumptions questionable, interpret the estimate cautiously.

6

Document what was used

When CrCl affects a medication decision, retain the selected dosing weight and renal estimate so another clinician can reproduce the reasoning.

CrCl Workflow — Complete

1. **Enter all patient fields**
   Sex • age • SCr • actual weight • height
2. **Calculate**
   The tool determines IBW, 120% threshold, and adjusted weight
3. **Verify selected weight**
   Actual if ≤120% IBW; adjusted if >120% IBW
4. **Read CrCl**
   Confirm the highlighted Cockcroft-Gault result
5. **Audit details**
   Compare ABW vs AdjBW estimates and expand the formula
6. **Apply clinically**
   Check renal trajectory and medication-specific dosing guidance

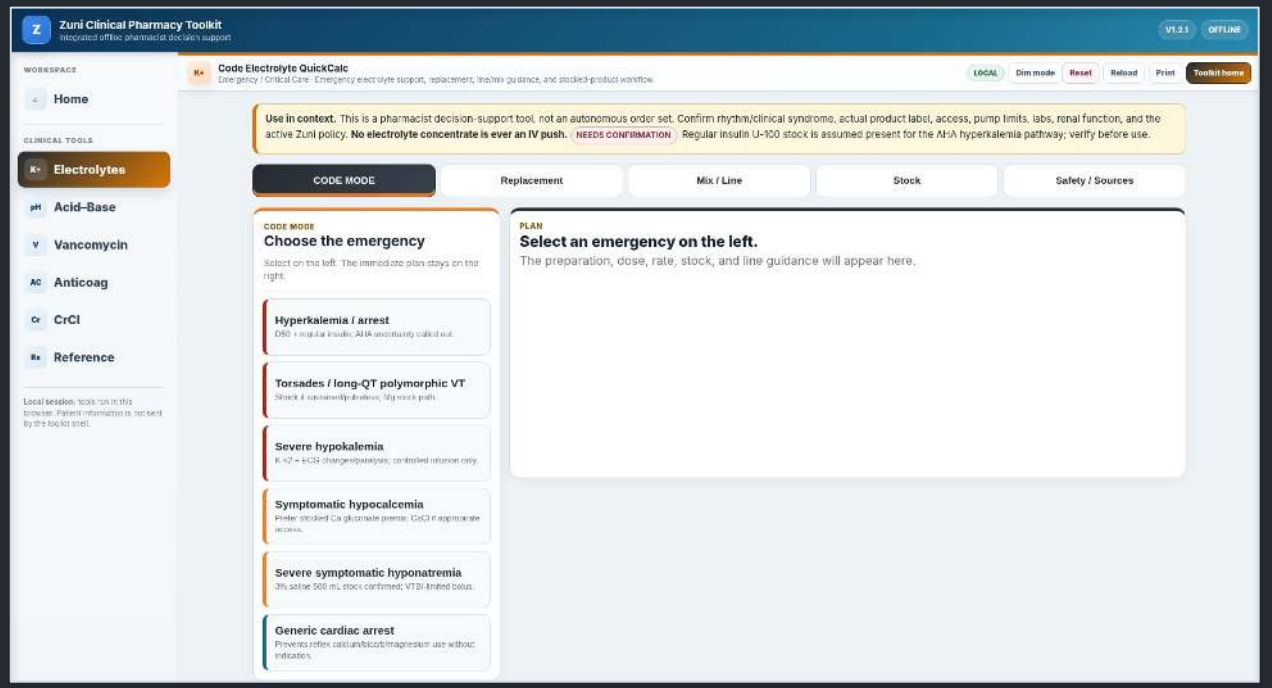
The result is most useful when the user can explain exactly which weight and formula produced it.

Electrolyte QuickCalc

Complete walkthrough of CODE MODE, Replacement, Mix / Line, Stock, and Safety / Sources

Purpose

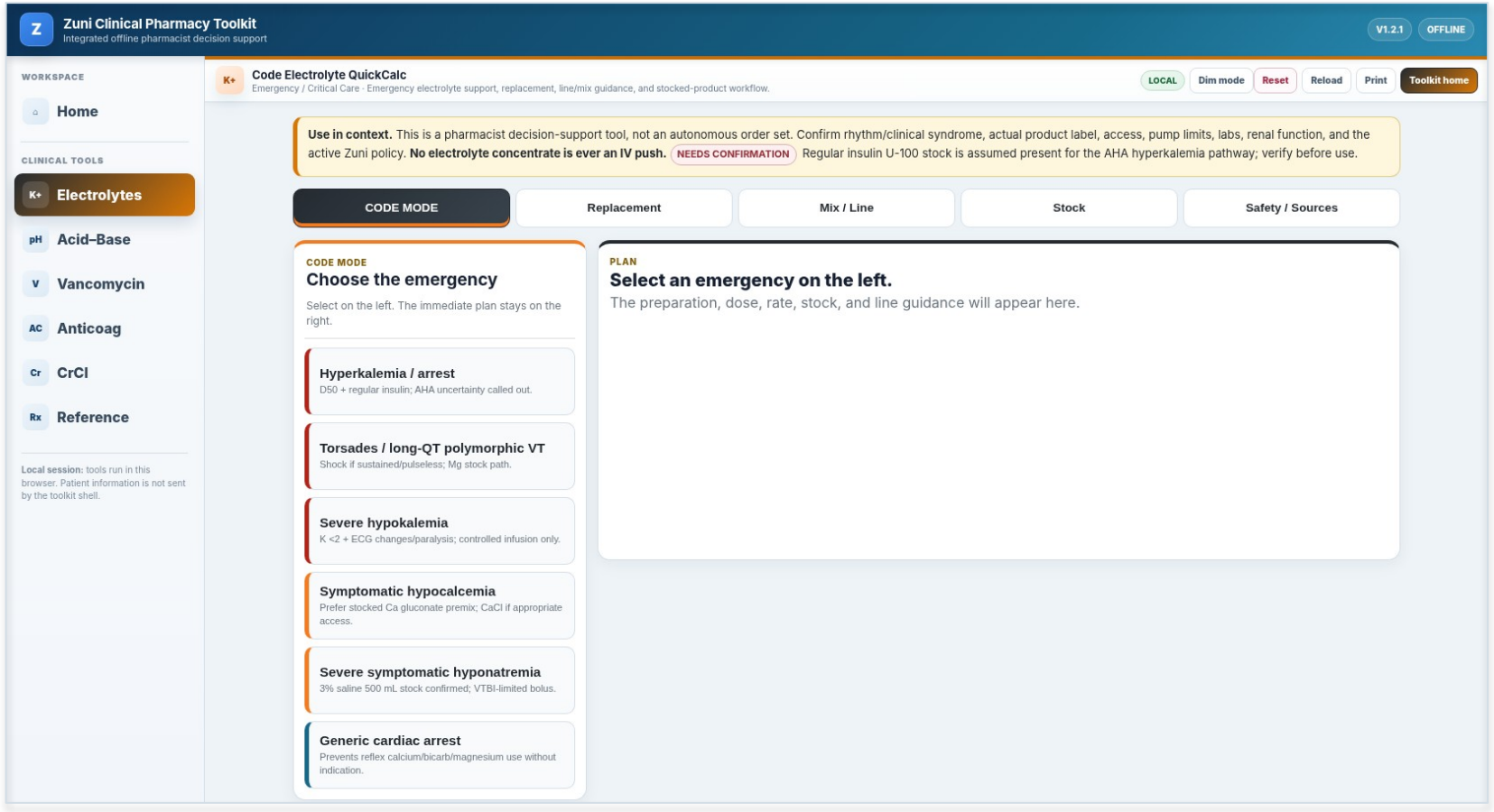
Train pharmacists to move from emergency syndrome or lab abnormality to a stock-aware, line-aware, pump-aware plan without skipping the module’s guardrails.



1

Know the five work areas

Use the tab that matches the question you are answering—not every case begins in CODE MODE.



1 **CODE MODE**

Six emergency syndrome pathways.

2 **Replacement**

Patient/lab-driven routine replacement planning.

3 **Mix / Line**

Preparation, access, collision checking, and pump math.

4 **Stock**

Photographed Zuni stock and presentations.

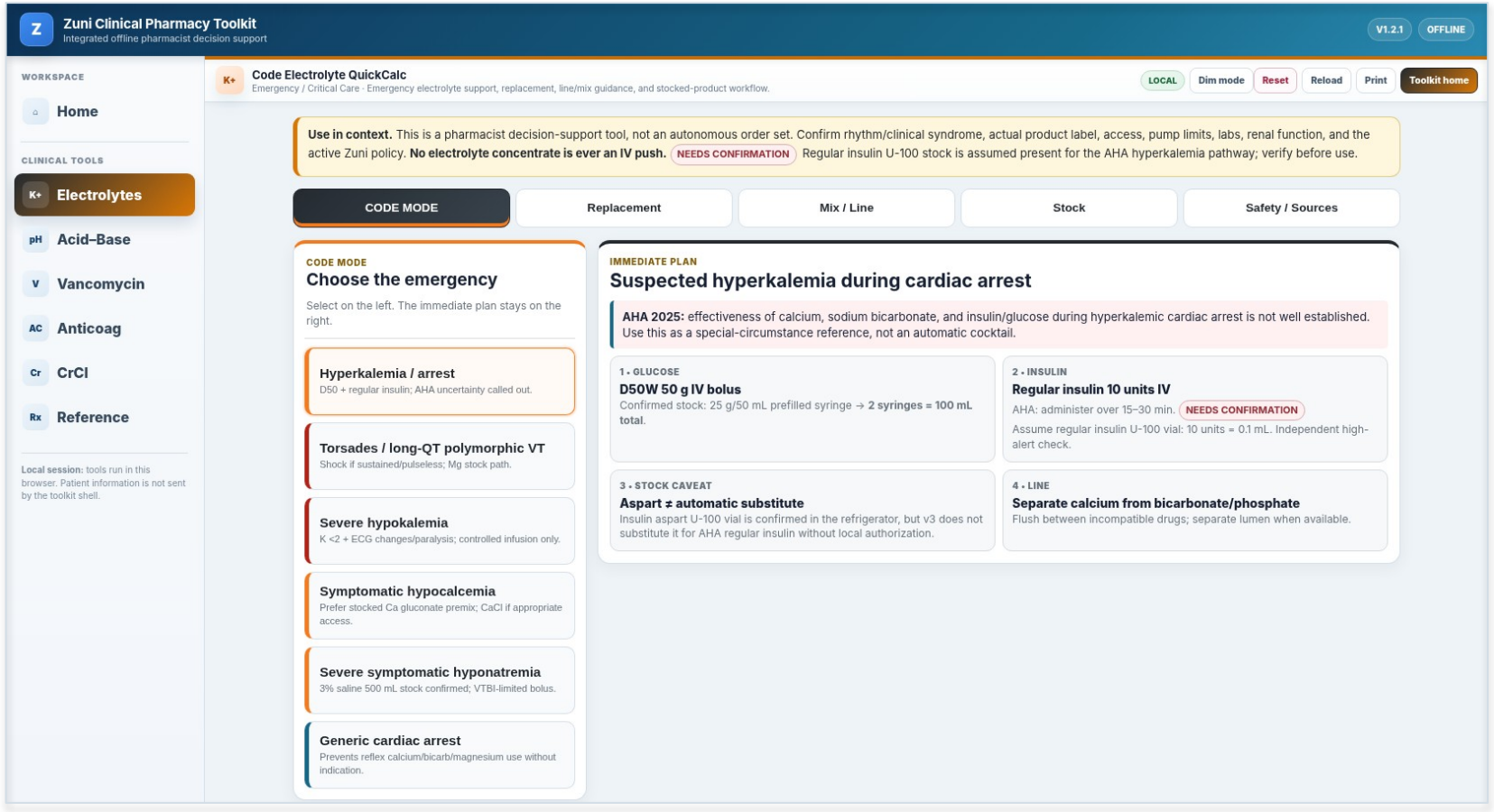
5 **Safety / Sources**

Guardrails, source hierarchy, and institutionalization checklist.

2

Hyperkalemia / arrest

Select the syndrome; the right side becomes the immediate preparation and administration plan.



1

Emergency pathway

D50 + regular insulin guidance is grouped with preparation details.

2

Stock caveat

Regular insulin U-100 is assumed present but explicitly marked NEEDS CONFIRMATION.

3

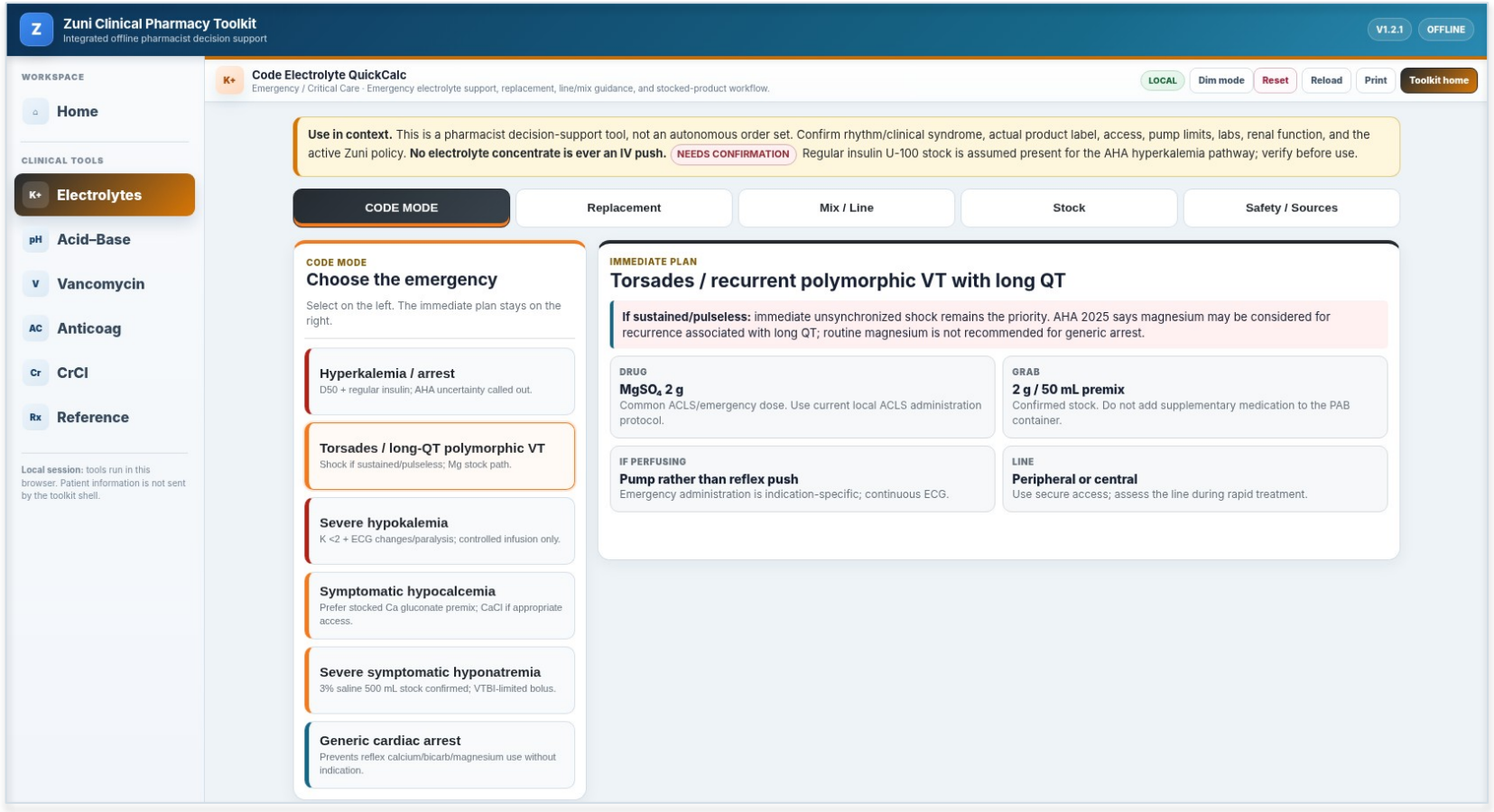
Use the whole plan

Review dose, product, access, monitoring, and caveats—not just the first line.

3

Torsades / long-QT polymorphic VT

The pathway keeps electrical therapy priority and magnesium preparation in one view.



1

Priority first

Sustained or pulseless polymorphic VT still requires the appropriate shock pathway.

2

Magnesium path

The tool connects the emergency dose with the stocked $MgSO_4$ presentation.

3

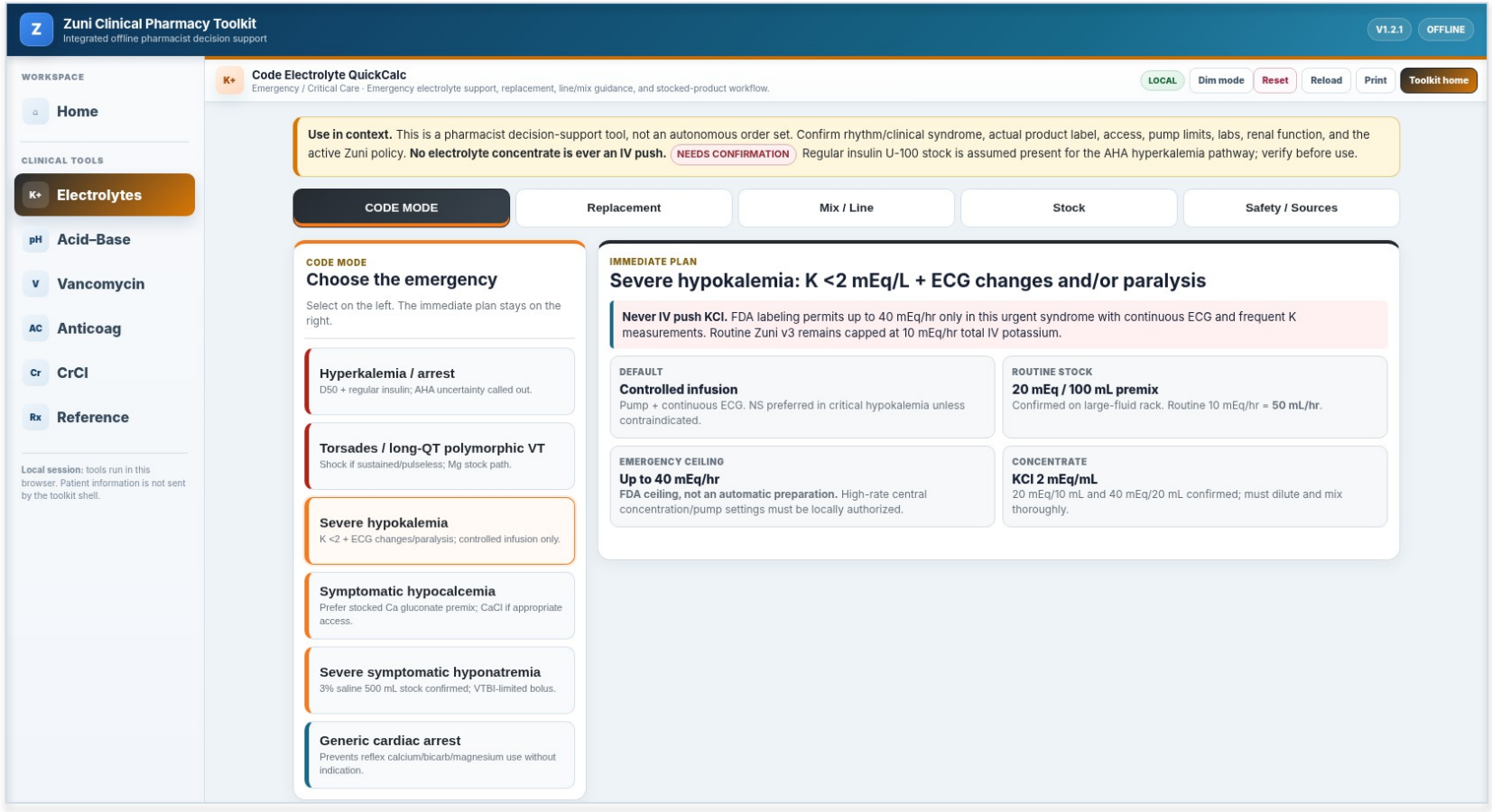
Administration context

Rate, line, and monitoring information stay beside the dose.

4

Severe hypokalemia

CODE MODE is the only place the tool exposes the severe-hypokalemia ceiling; routine replacement remains capped more conservatively.



1

Use only for the defined emergency

The button itself specifies K <2 with ECG changes/paralysis.

2

Controlled infusion

Electrolyte concentrate is never treated as an IV push.

3

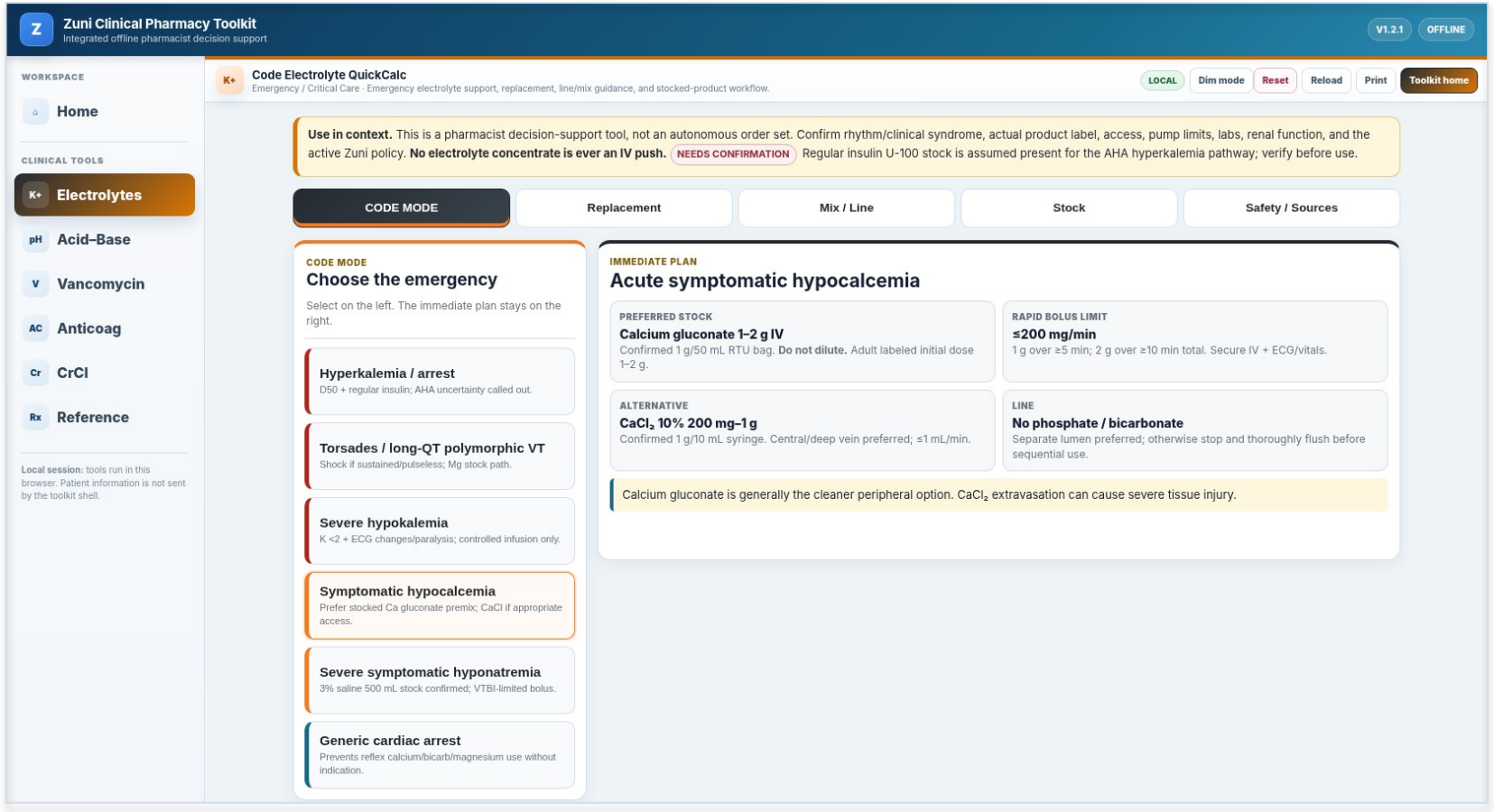
Do not import this rate into routine care

Routine Replacement intentionally locks combined IV potassium to 10 mEq/hr.

5

Symptomatic hypocalcemia

The emergency pathway distinguishes the stocked calcium options and the importance of access.



1

Preferred stocked option

The module favors the stocked calcium gluconate premix when appropriate.

2

Access matters

Calcium chloride is handled separately because product/access considerations differ.

3

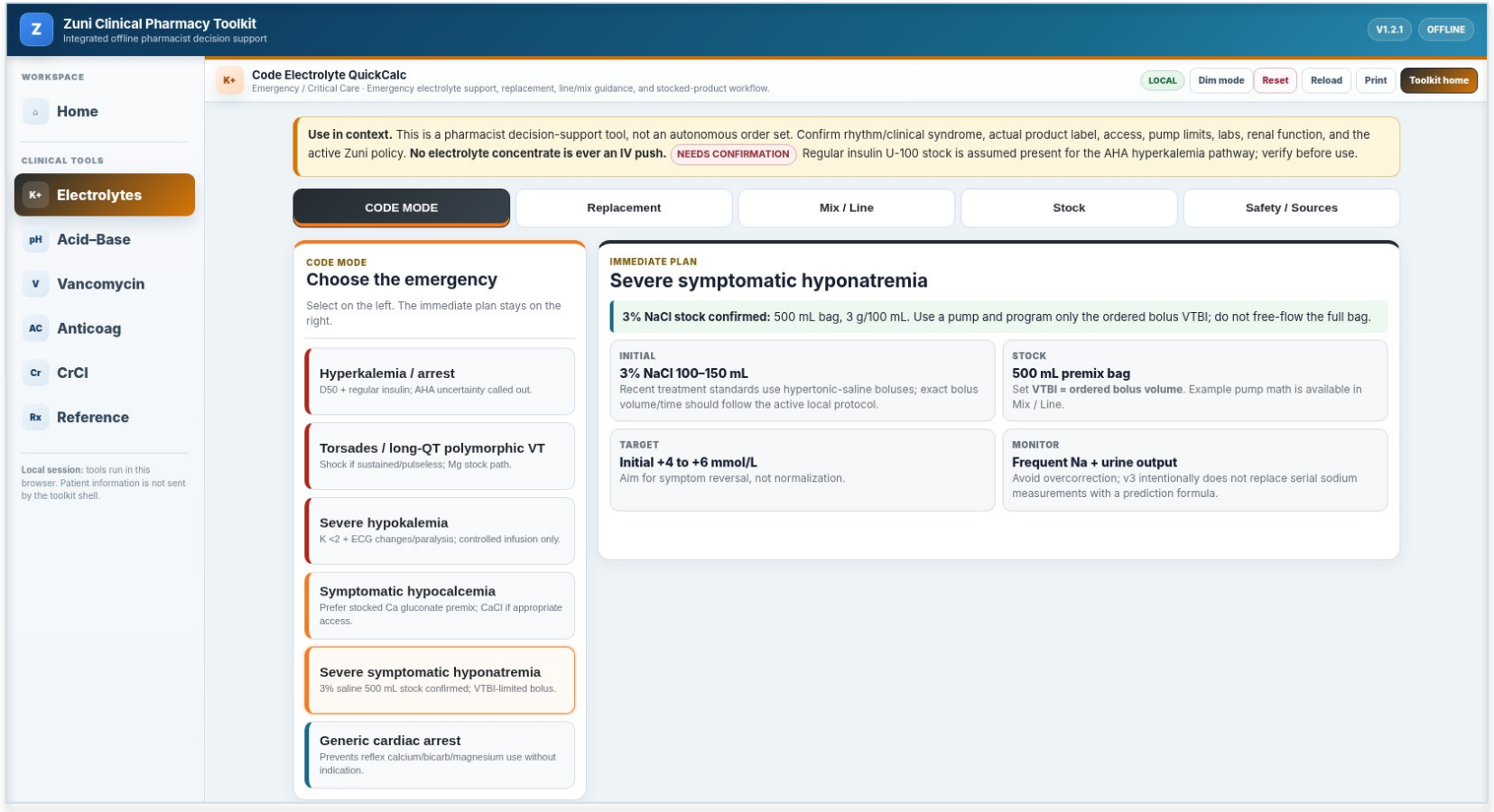
Verify the syndrome

Use patient-specific ECG, symptoms, ionized calcium when available, and the actual product label.

6

Severe symptomatic hyponatremia

The tool uses the confirmed 3% NaCl bag while emphasizing VTBI-limited bolus administration.



1

Confirmed stock

3% sodium chloride is represented as the stocked 500 mL bag.

2

Limit the delivered volume

Program the ordered bolus/VTBI rather than allowing the full bag to infuse.

3

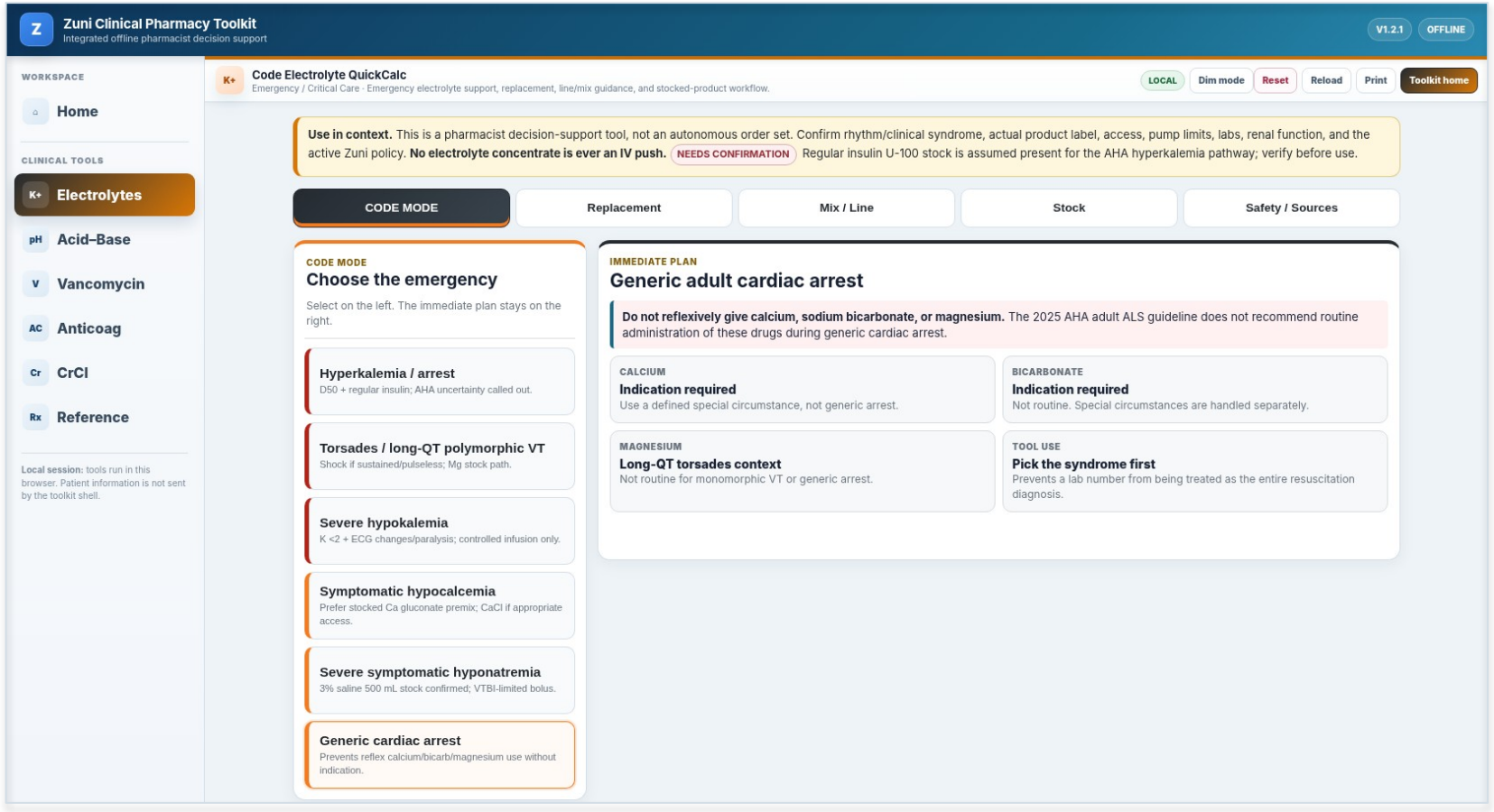
Reassess

Serial sodium and symptoms—not a formula in this tool—drive subsequent therapy.

7

Generic cardiac arrest

This pathway is intentionally conservative: it prevents reflex electrolyte use without a specific indication.



1

Not every arrest needs an electrolyte

The generic pathway is a guardrail against automatic calcium, bicarbonate, or magnesium use.

2

Find the indication

Move to a specific emergency pathway when the clinical syndrome supports it.

3

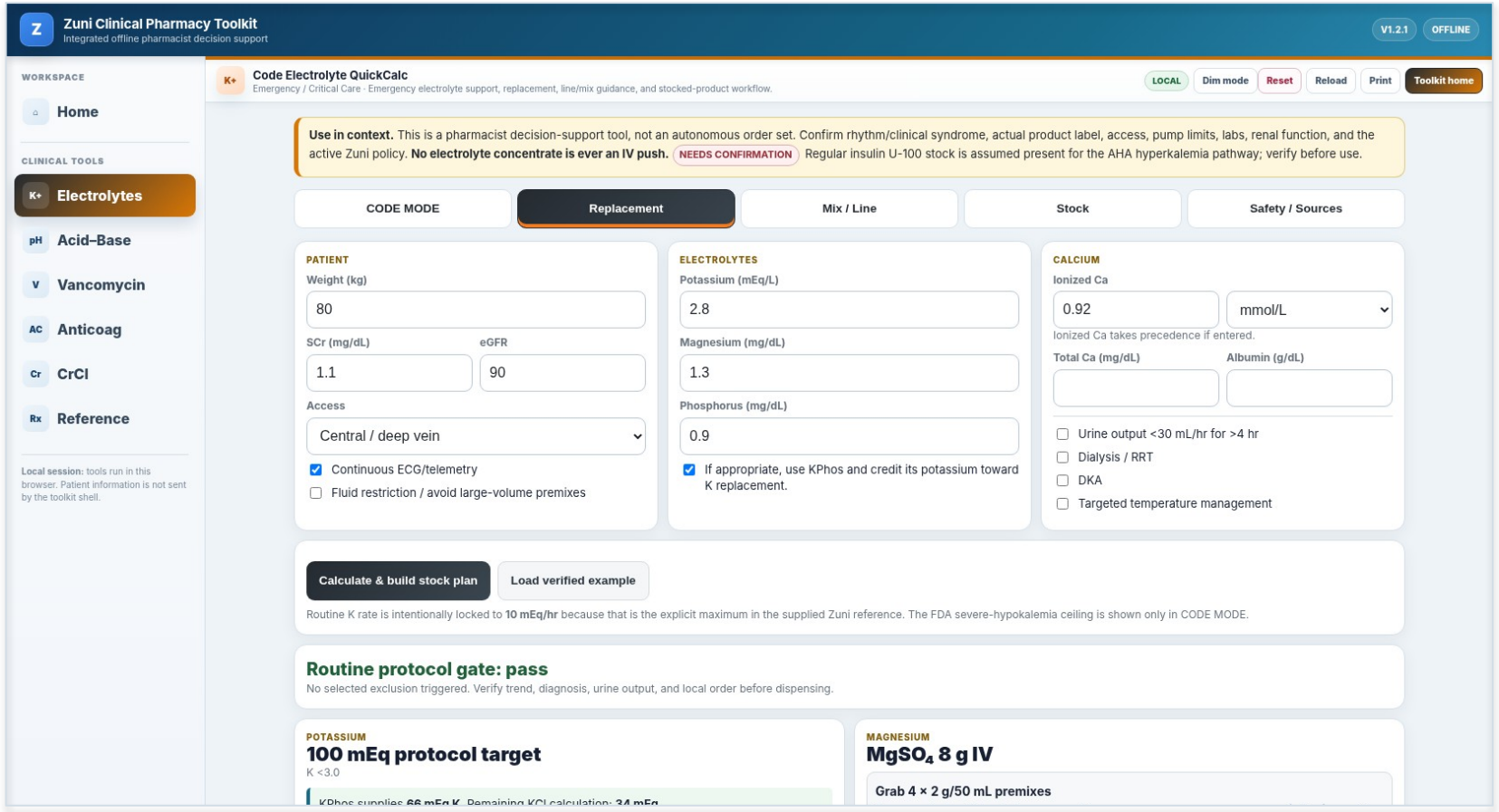
Decision support, not protocol replacement

Follow the active resuscitation algorithm and local policy.

8

Replacement: enter patient context and labs

Routine replacement is a different workflow from CODE MODE.



1

Patient context

Weight, SCr/eGFR, access, telemetry, and fluid restriction affect whether/how the tool builds a plan.

2

Electrolytes

K, Mg, phosphorus, and calcium can be evaluated in one pass.

3

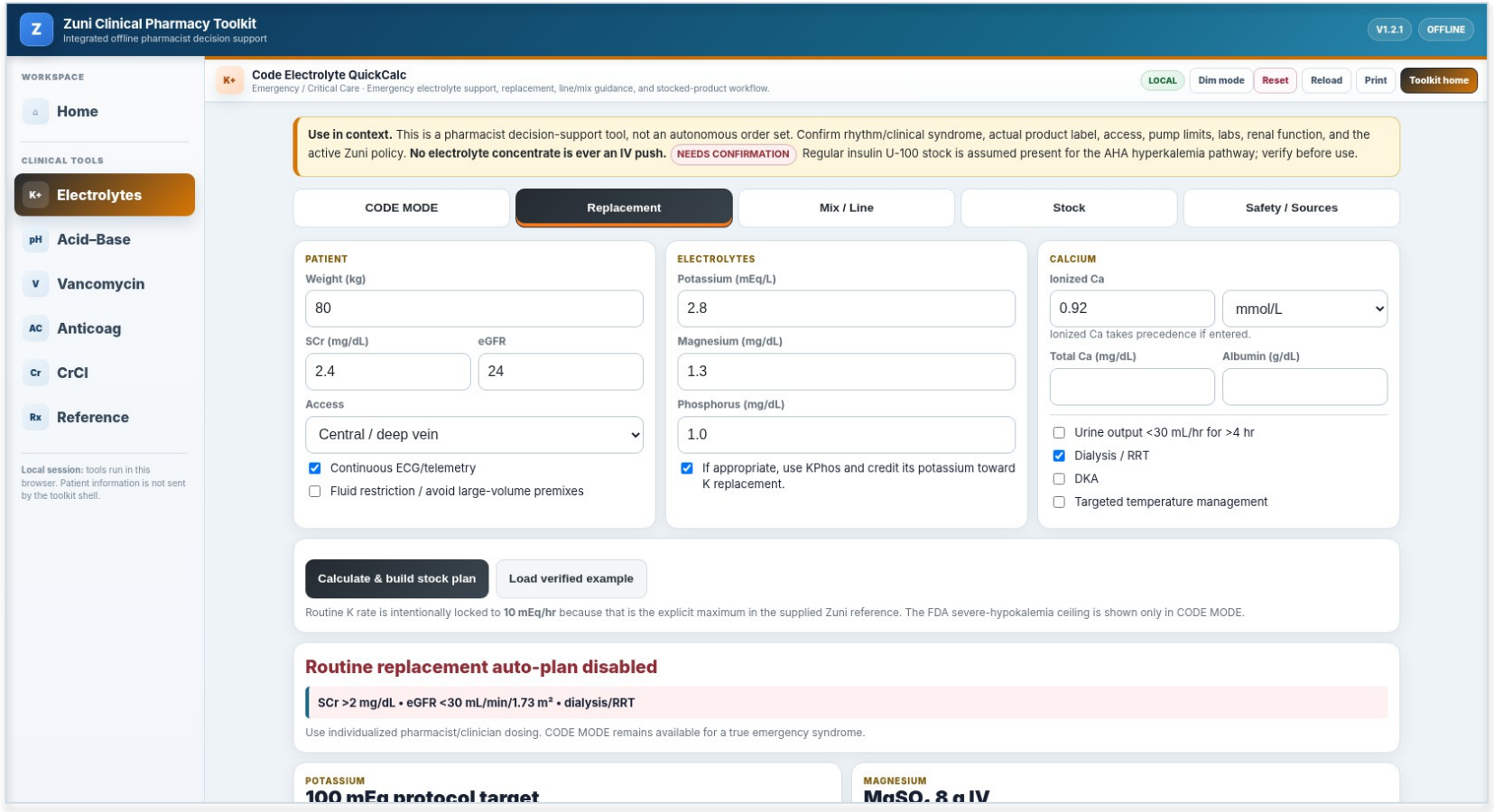
Stock-aware output

The plan ties the replacement recommendation to the available presentation and infusion time.

9

Replacement guardrails: know when automation stops

The calculator intentionally refuses routine auto-planning in several higher-risk contexts.



1

Renal risk / RRT

SCr >2, eGFR <30, low urine output, or dialysis/RRT can stop routine auto-planning.

2

Other exclusions

DKA and targeted temperature management are also individualized rather than auto-dosed.

3

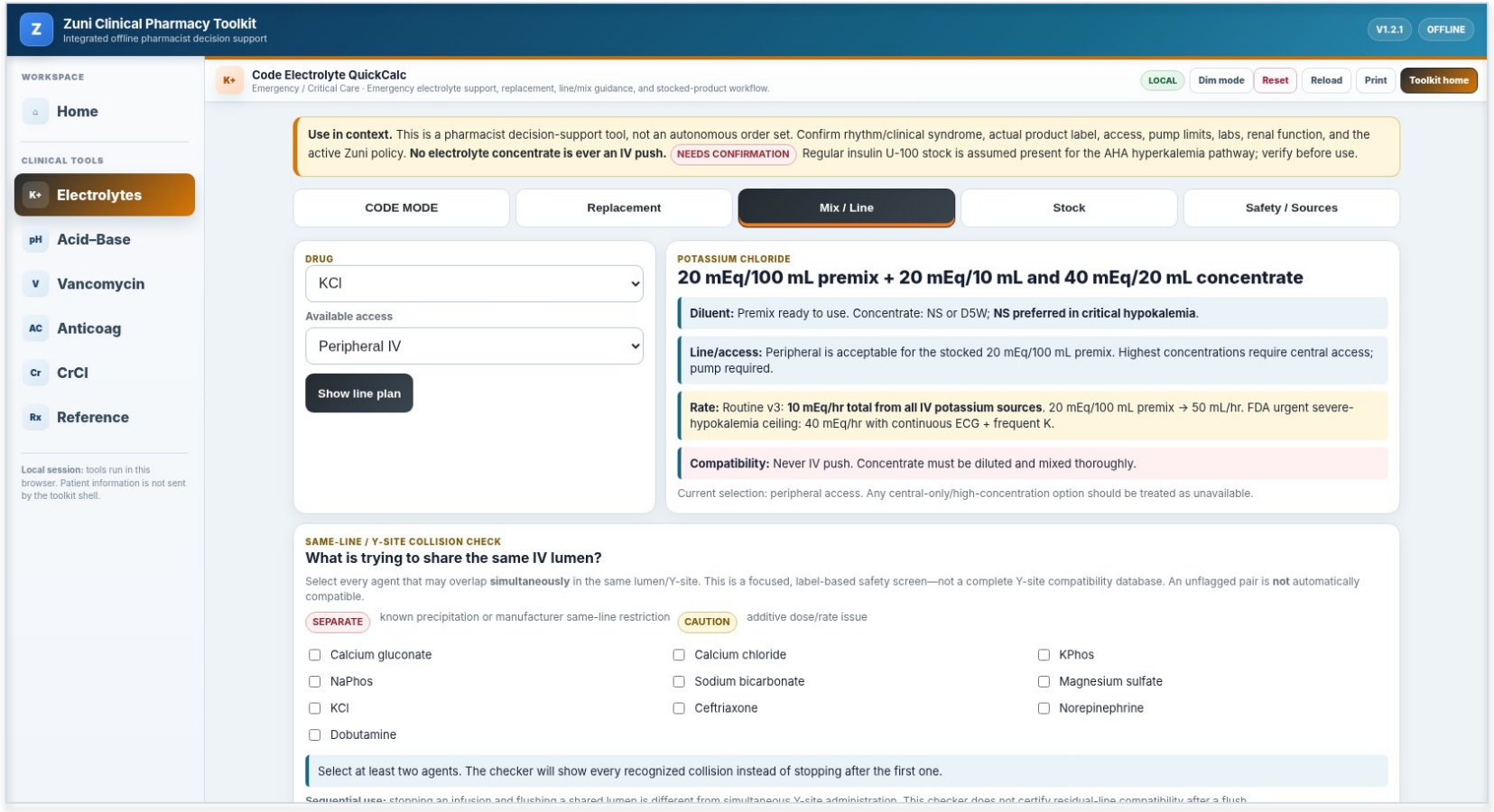
What to do next

Use clinical judgment, active protocols, and the module's emergency pathways only when the emergency definition is actually met.

10

Mix / Line: answer preparation and access questions

Select the drug and available access, then generate the line plan.



1

Choose drug

KCl, $MgSO_4$, KPhos, NaPhos, calcium salts, bicarbonate, and 3% NaCl are available.

2

Choose access

Peripheral versus central/deep access changes what the plan should emphasize.

3

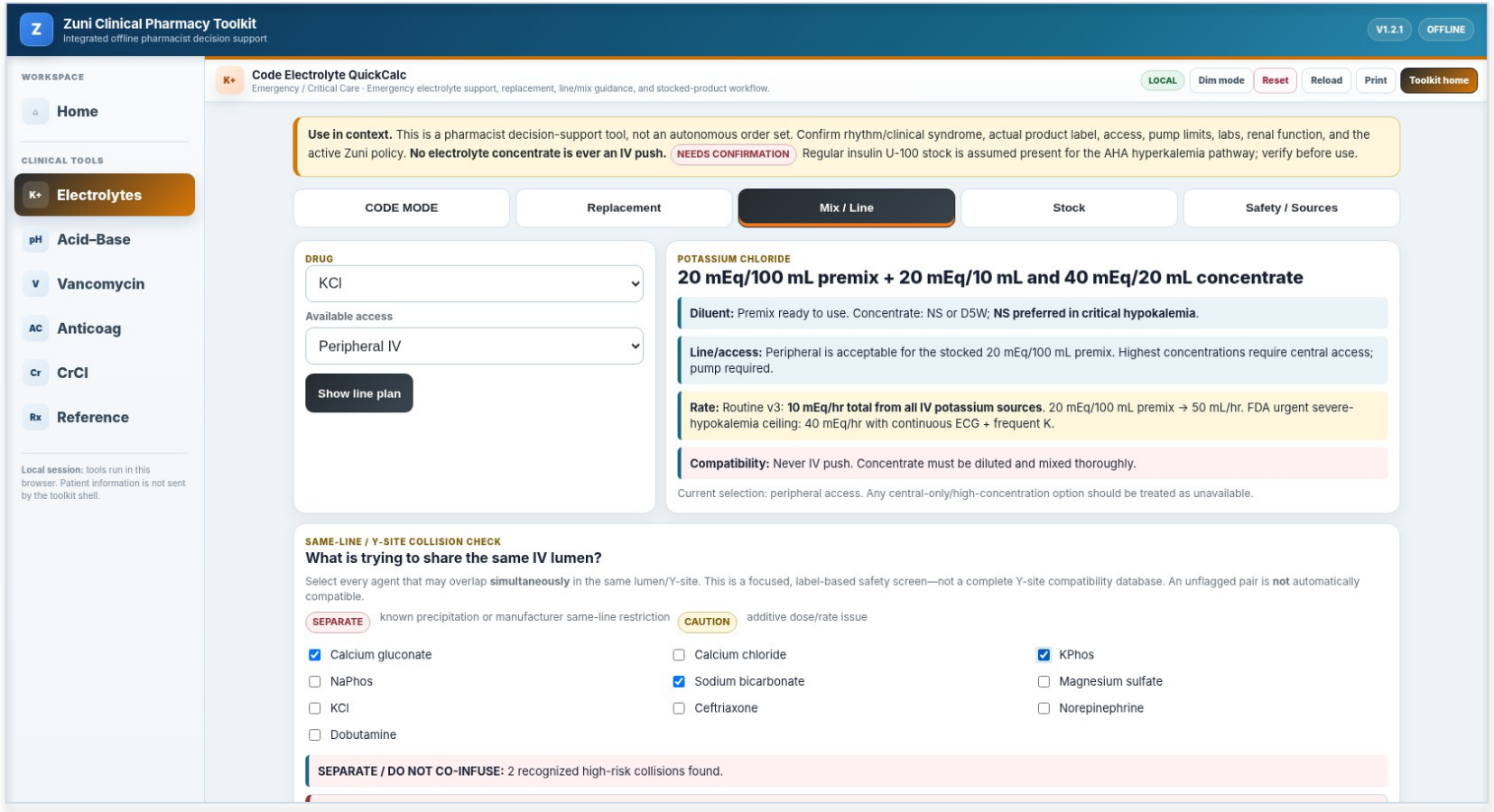
Read beyond the diluent

Review concentration, line/access guidance, rate limits, and stock presentation together.

11

Same-line / Y-site collision checker

This tool screens recognized collisions among agents that may overlap simultaneously in one lumen.



1

Select simultaneous agents

Choose every agent that may overlap in the same lumen/Y-site.

2

Interpret the flags

SEPARATE = known precipitation/manufacturer restriction; CAUTION = additive dose/rate concern.

3

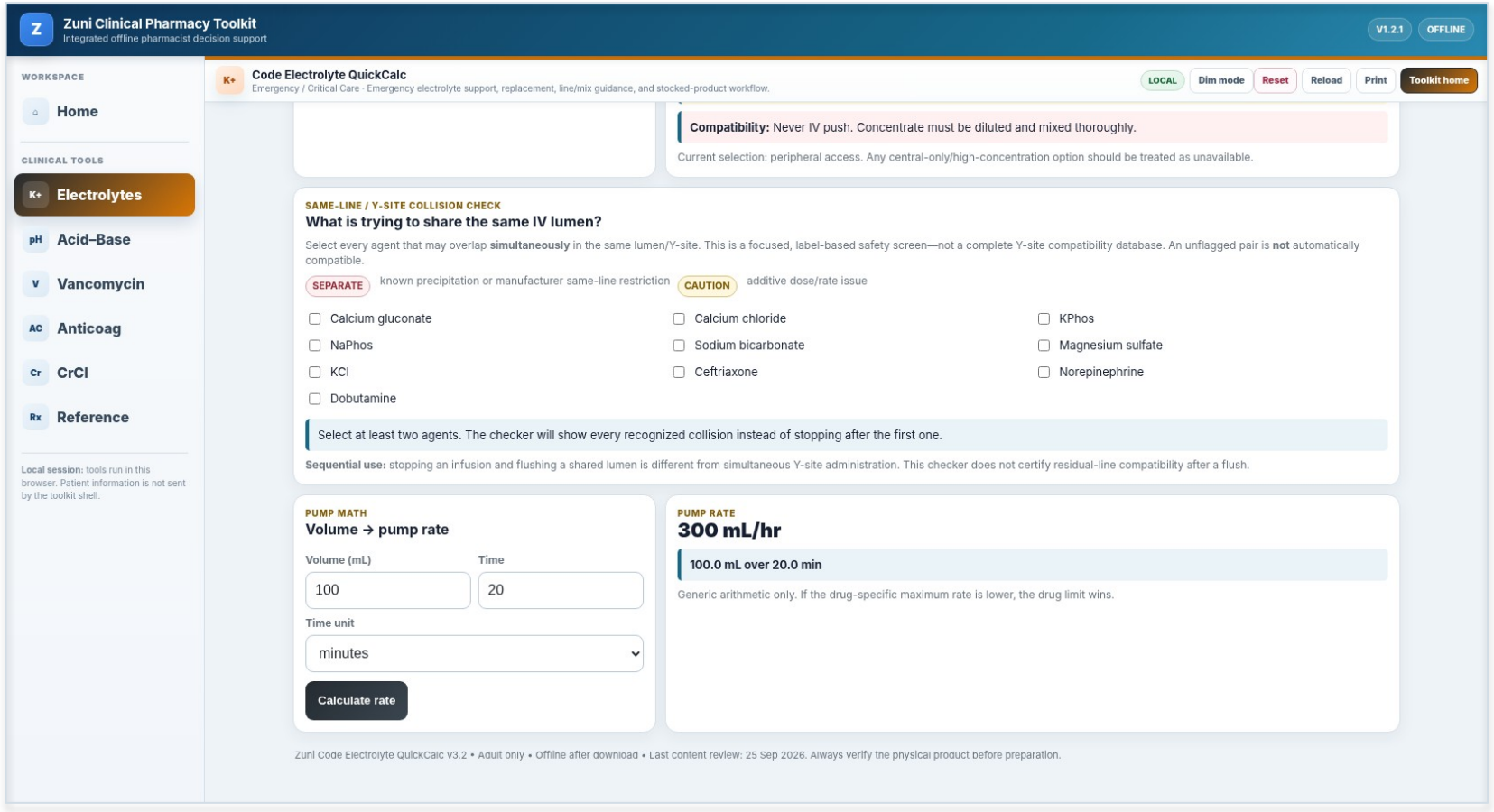
Know the limitation

An unflagged pair is not automatically compatible, and sequential use after a flush is a different question.

12

Pump math: convert volume and time to a pump rate

Use the generic calculator for arithmetic, then apply the drug-specific maximum rate separately.



1

Enter volume

Example shown: 100 mL.

2

Enter time and unit

Example shown: 20 minutes.

3

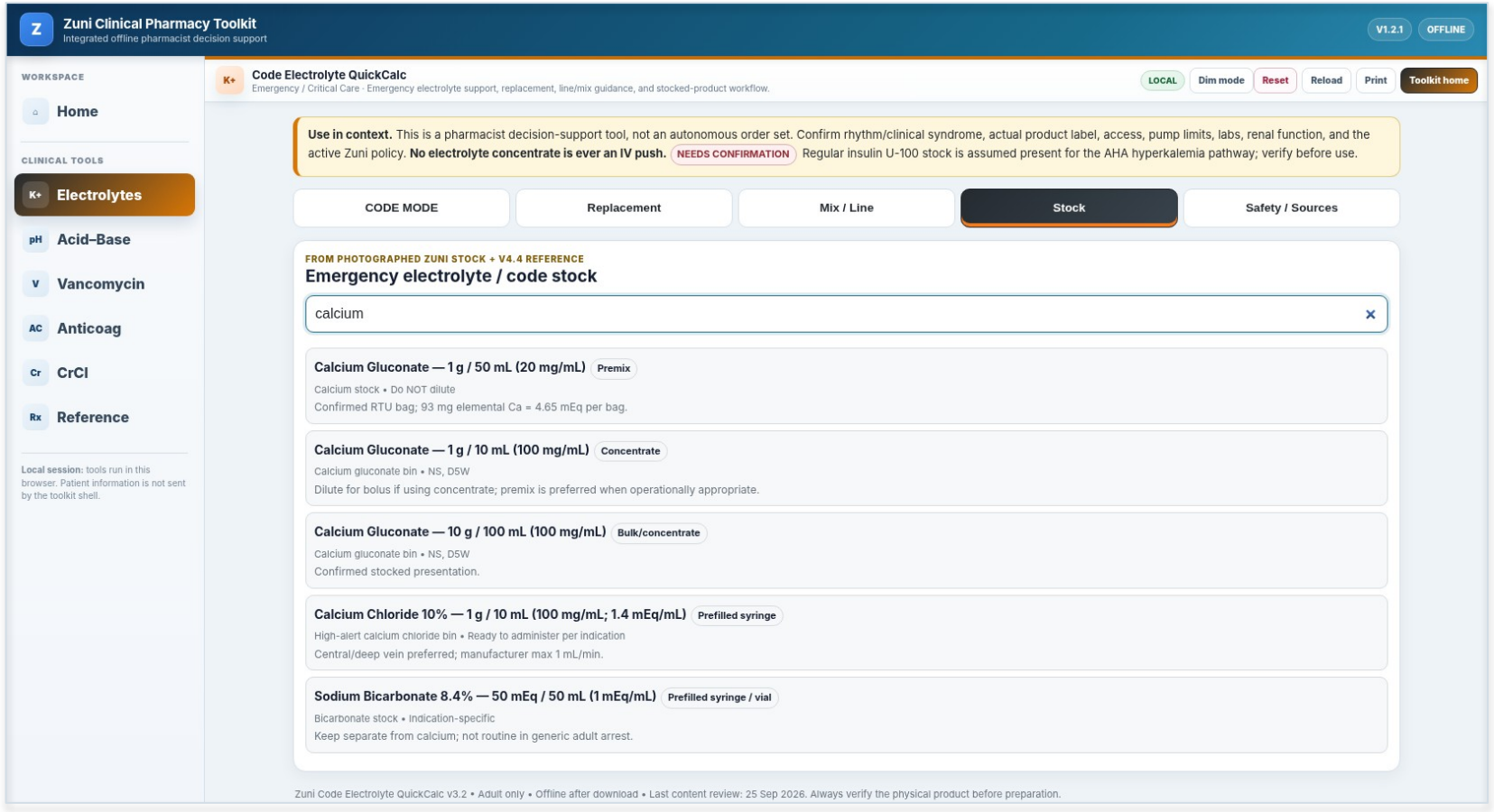
Use the calculated rate carefully

100 mL over 20 min = 300 mL/hr, but the medication-specific rate limit still controls.

13

Stock: verify the product you expect to prepare

The Stock tab is based on photographed Zuni stock plus reference context.



1

Search the inventory view

Use the stock list to locate the expected presentation/strength.

2

Match the physical product

Always reconcile the screen with the actual vial/bag label in hand.

3

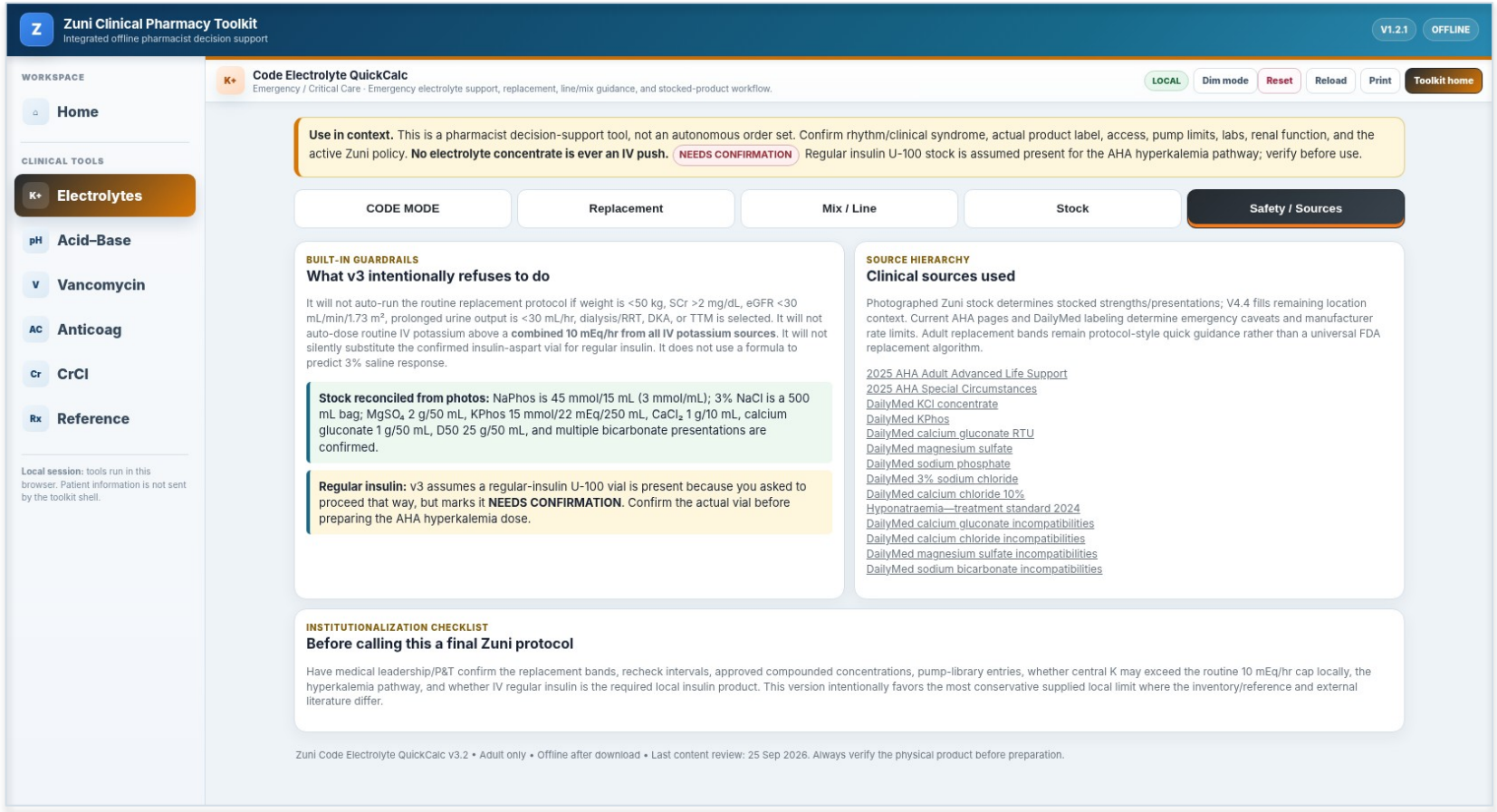
Stock drives preparation

The emergency and replacement plans are designed around the confirmed local presentations.

14

Safety / Sources: understand what the tool refuses to do

This tab is part of the workflow—not merely documentation.



1

Built-in guardrails

The module lists the situations it will not auto-dose and the routine IV K cap.

2

Source hierarchy

Photographed Zuni stock, the local reference, AHA material, and DailyMed labeling serve different roles.

3

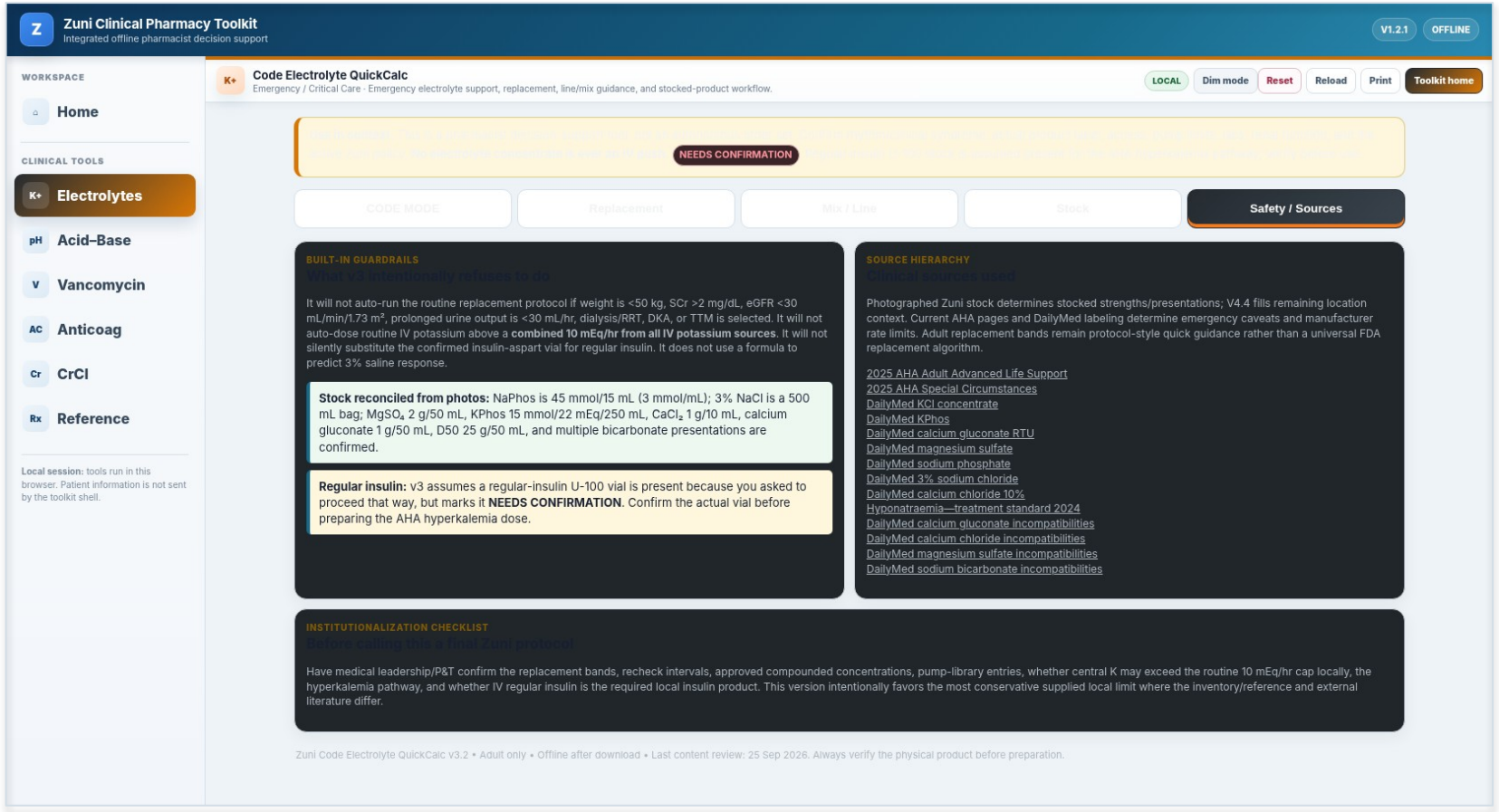
Institutionalization checklist

The page identifies items still requiring local leadership/P&T confirmation before treating the tool as a final protocol.

15

Dim mode, Reset, and persistent toolkit controls

These controls affect workflow but do not change the underlying clinical logic.



1

Dim mode

Use for a lower-luminance interface; toggle it from the module toolbar.

2

Reset

Clears the module state when moving to a new patient/scenario.

3

Reload / Print / Toolkit home

Persistent ZSURx controls remain available above the module.

Electrolyte QuickCalc: complete workflow

Start with the clinical question, then use the narrowest tool that answers it.

1

Identify

Emergency syndrome vs routine replacement vs preparation question

2

Select

CODE MODE, Replacement, or Mix / Line

3

Build

Enter syndrome/labs/access and generate the plan

4

Cross-check

Stock, line collision, pump math, and rate limits

5

Verify

Actual label, monitoring, renal context, sources, and local policy

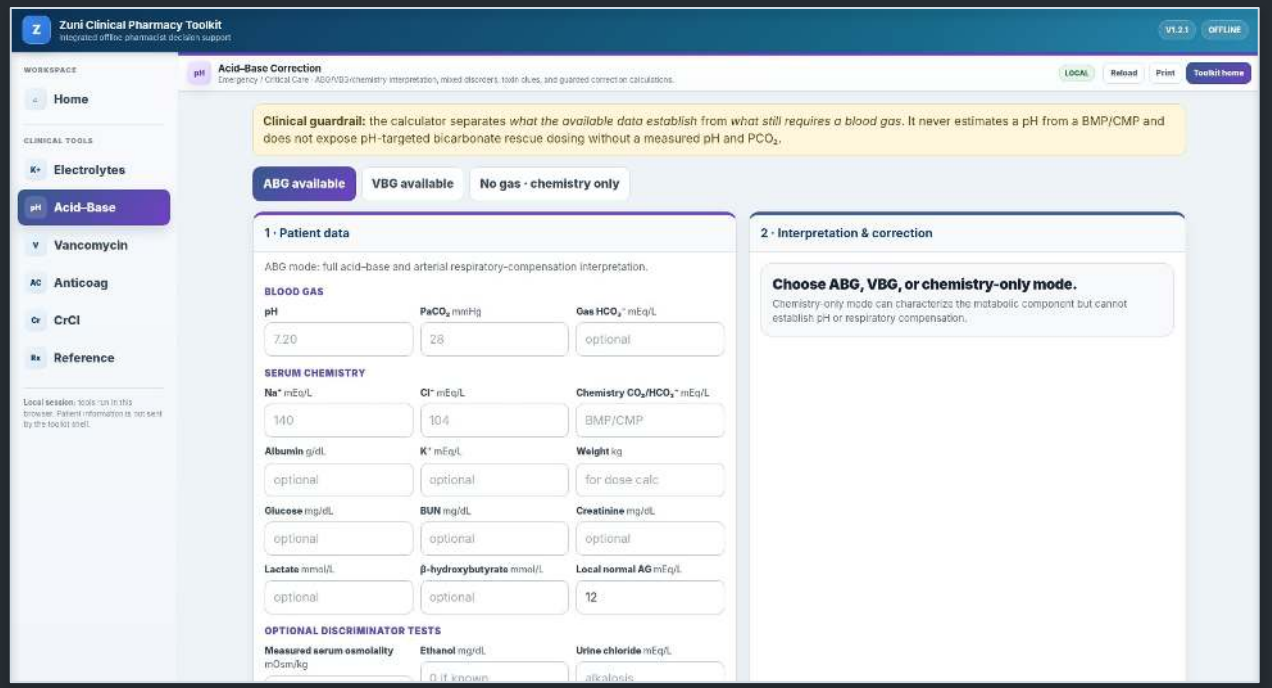
No electrolyte concentrate is ever an IV push. Fast support still requires pharmacist verification.

Acid–Base Correction Calculator

Complete walkthrough of ABG, VBG, chemistry-only screening, mixed disorders, correction tools, and guardrails

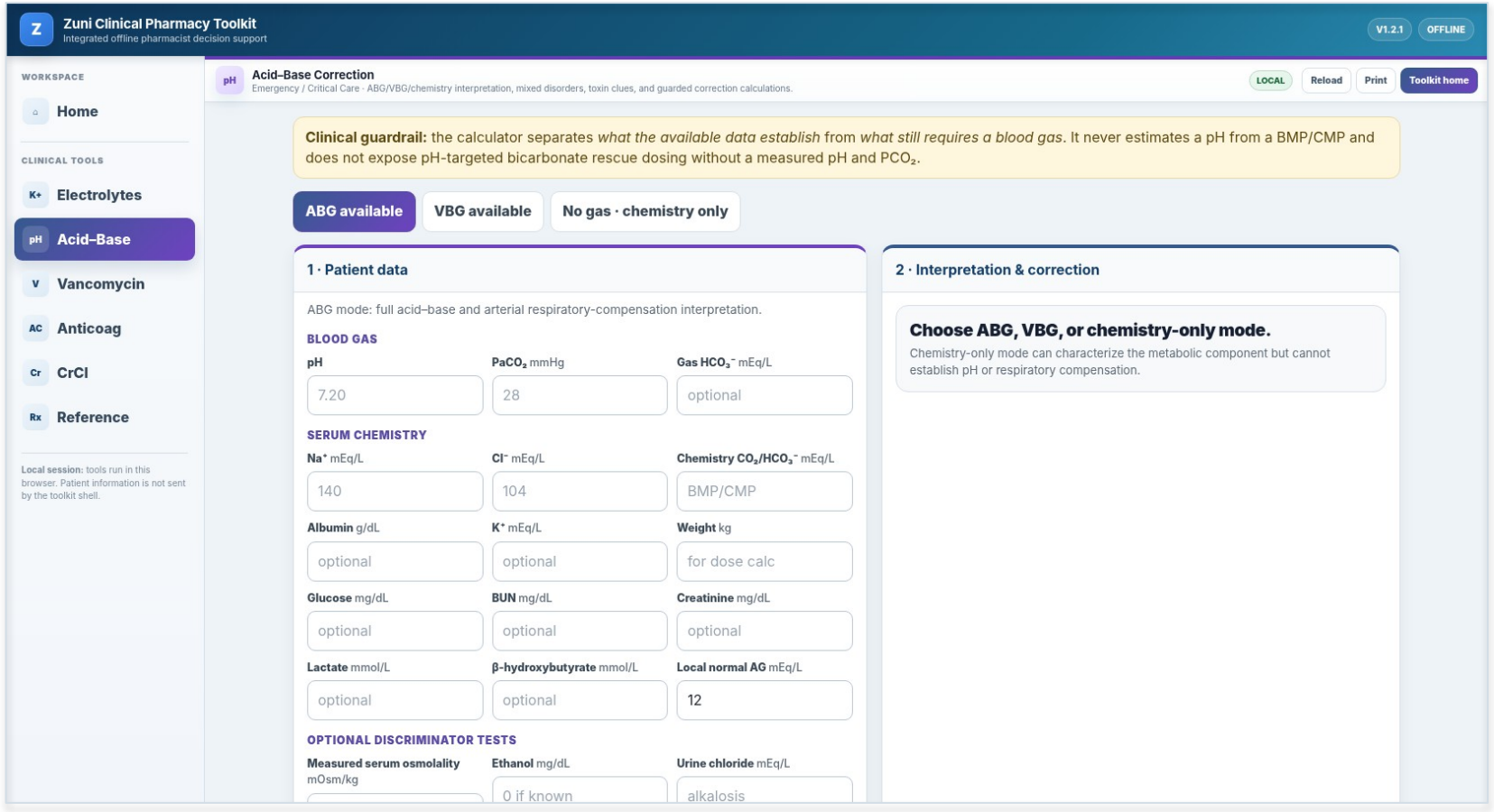
Purpose

Train pharmacists to distinguish what the available data establish, identify mixed acid–base patterns, and use the calculator's guarded correction tools without over-interpreting chemistry-only or venous data.



1 Start by choosing the data you actually have

The calculator deliberately changes what it will conclude based on ABG, VBG, or chemistry-only input.



1 **ABG available**

Full acid–base interpretation and arterial respiratory-compensation testing.

2 **VBG available**

pH/HCO_3^- are useful; PCO_2-based respiratory conclusions remain approximate.

3 **No gas · chemistry only**

Characterizes the metabolic component without inventing pH or ventilation.

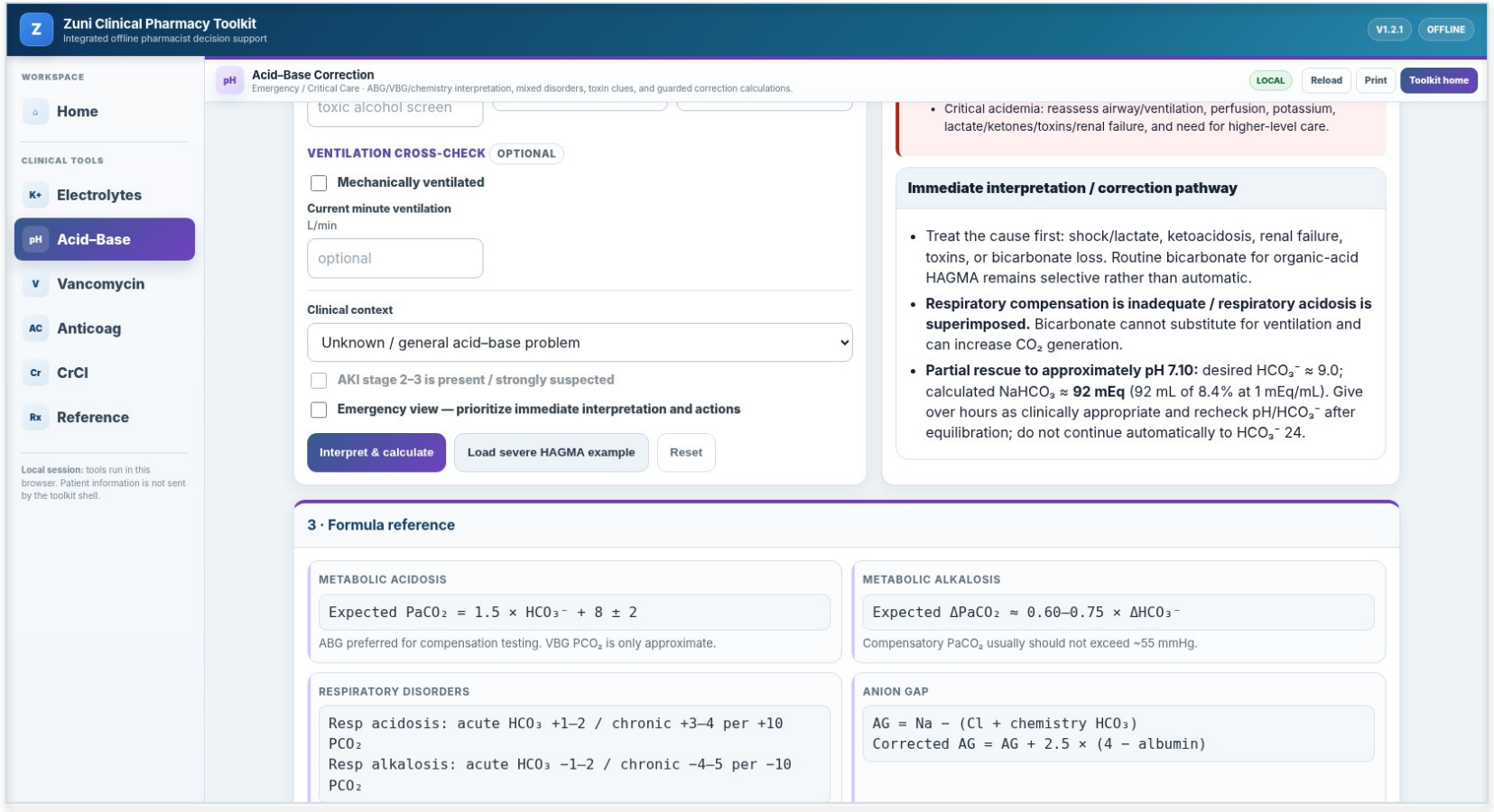
4 **Clinical guardrail**

The tool will not estimate pH from BMP/CMP or expose pH-targeted rescue dosing without measured pH and PCO_2.

2

ABG workflow: enter gas + chemistry together

The built-in example demonstrates a severe metabolic acidemia workflow with both gas and chemistry data.



1

Blood gas

Enter measured pH, $PaCO_2$, and gas HCO_3^- when available.

2

Chemistry

Na, Cl, chemistry CO_2/HCO_3^-, albumin, K, and cause-finding labs support the metabolic interpretation.

3

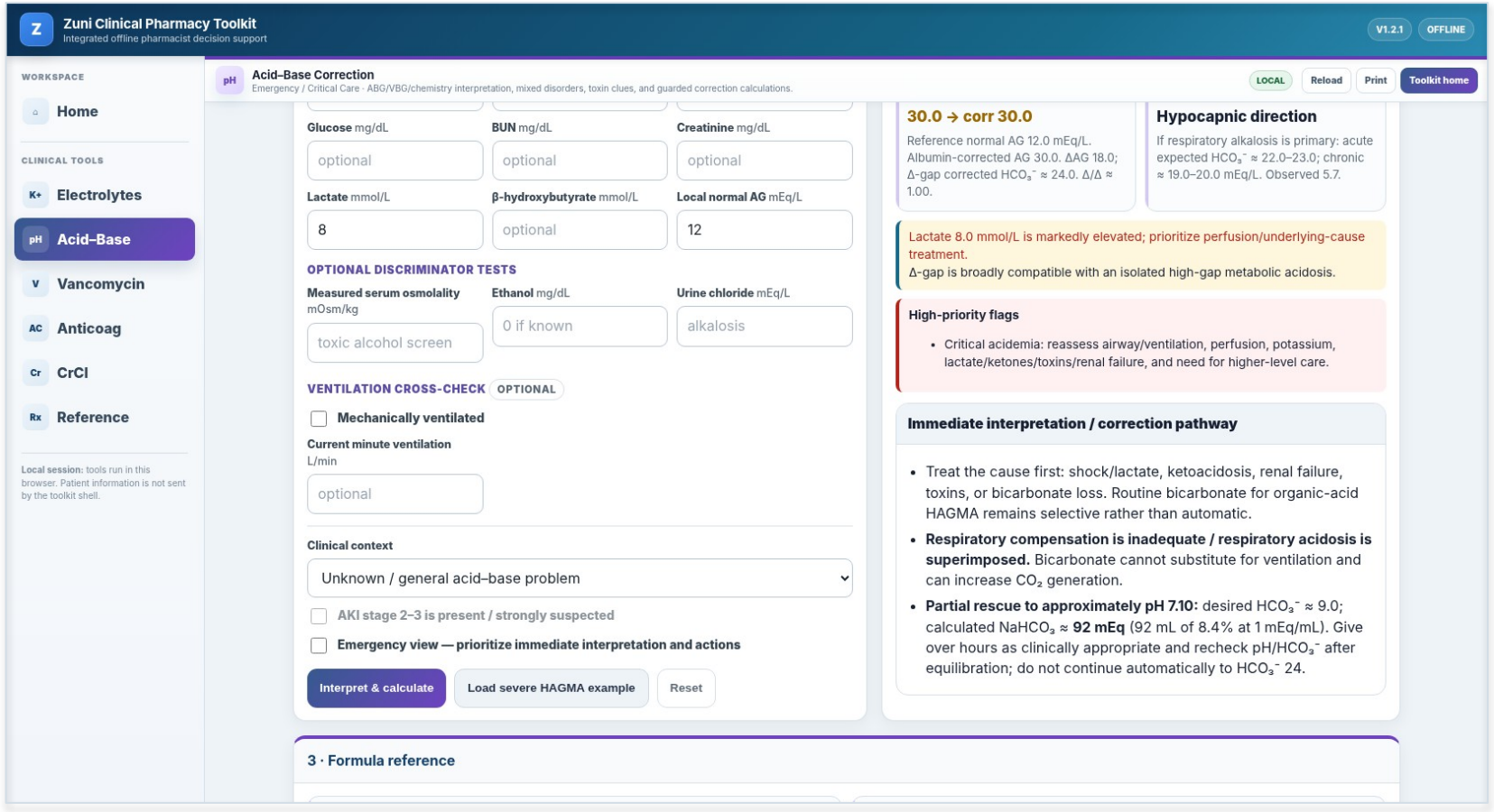
Clinical context

Choose the closest context because treatment language changes by DKA, sepsis, toxins, CKD, bicarbonate loss, or alkalosis.

3

Read the interpretation from top to bottom

The output separates the primary pattern, expected compensation, anion-gap analysis, warnings, and treatment considerations.



1

Primary pattern

Start with the acidemia/alkalemia and dominant metabolic or respiratory process.

2

Compensation

Compare measured $PaCO_2$ with the expected range; a mismatch raises concern for a mixed respiratory process.

3

Anion gap + Δ gap

Albumin correction and delta-gap calculations help reveal mixed metabolic disorders.

4

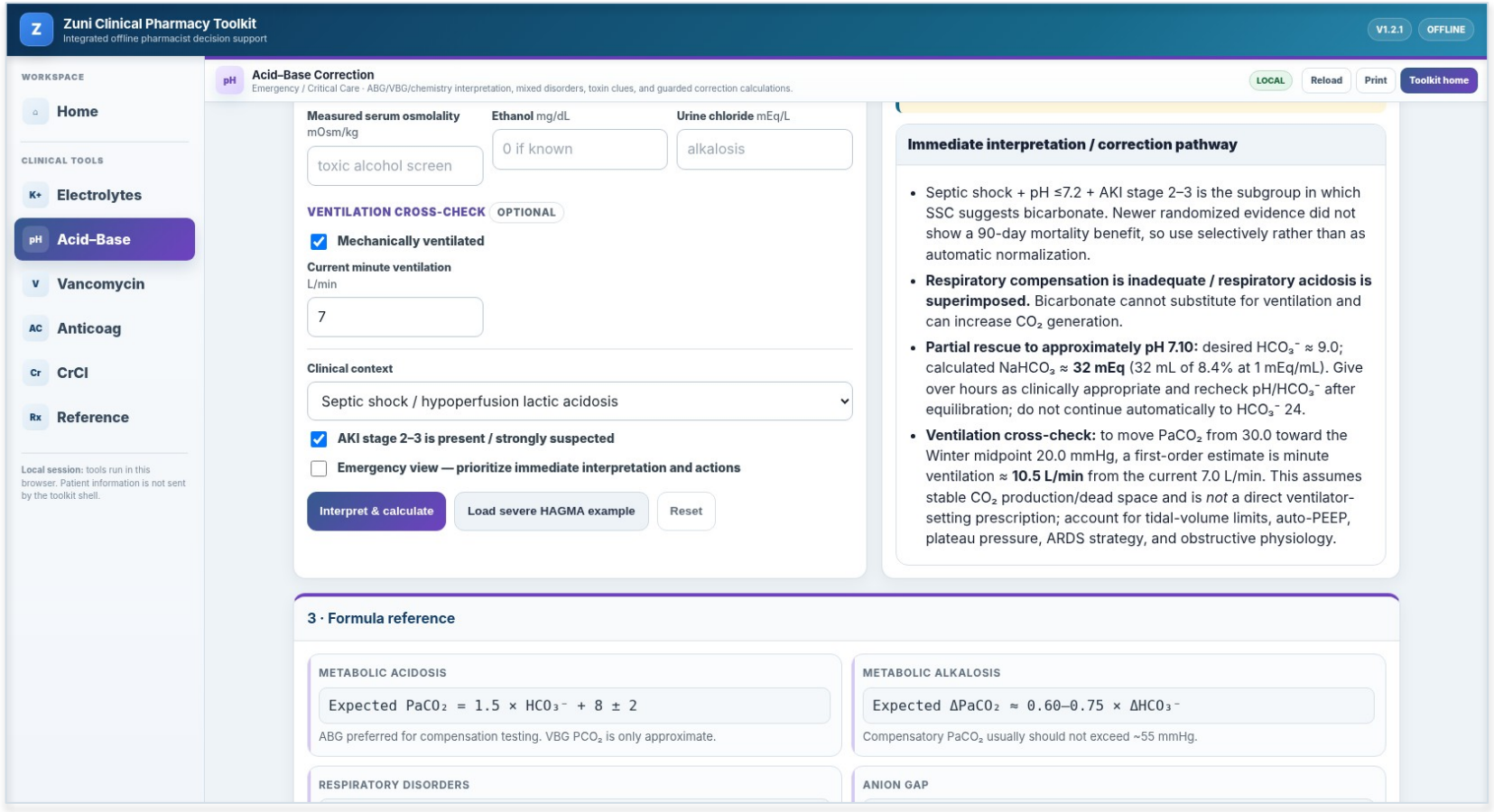
Warnings and plan

Cause-specific warnings and guarded correction options appear below the diagnostic summary.

4

Severe acidemia: correction tools remain guarded

This rendered sepsis/AKI example shows how context, compensation, and ventilation information are combined.



1

Context matters

The sepsis branch changes bicarbonate guidance when severe acidemia and AKI stage 2–3 are present.

2

Do not substitute bicarbonate for ventilation

If respiratory compensation is inadequate, the output explicitly flags the respiratory component.

3

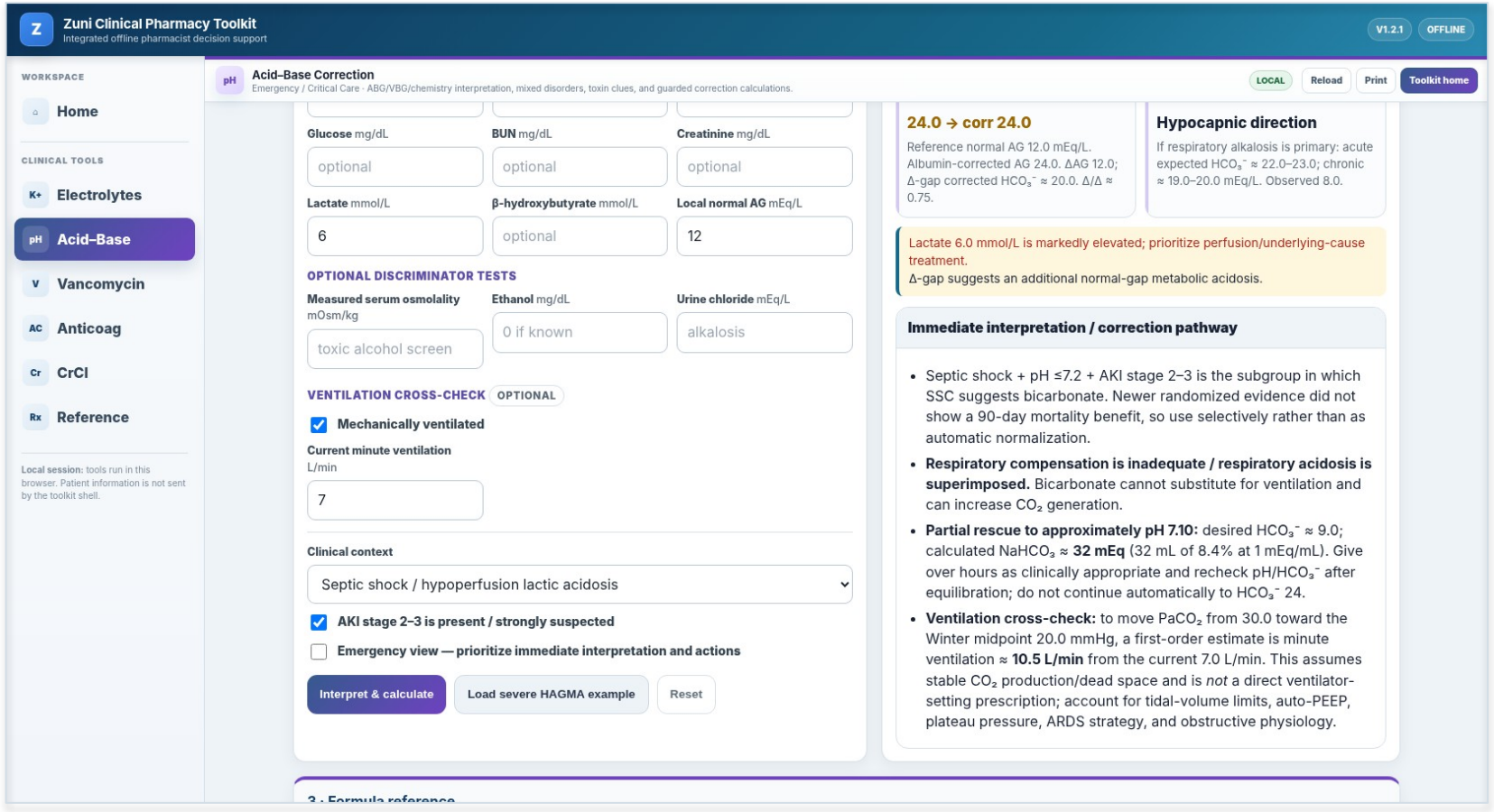
Weight unlocks rescue math

The partial-rescue calculation is only considered with measured gas data, severe metabolic acidemia, and the needed patient inputs.

5

Ventilation cross-check: use as an estimate, not a ventilator prescription

For an intubated patient, the calculator can compare current minute ventilation with the $PaCO_2$ target implied by compensation.



1

First-order estimate

Estimated new MV = current MV × current $PaCO_2$ / desired $PaCO_2$.

2

Assumptions are explicit

CO_2 production and dead-space fraction must be reasonably stable for the estimate to be meaningful.

3

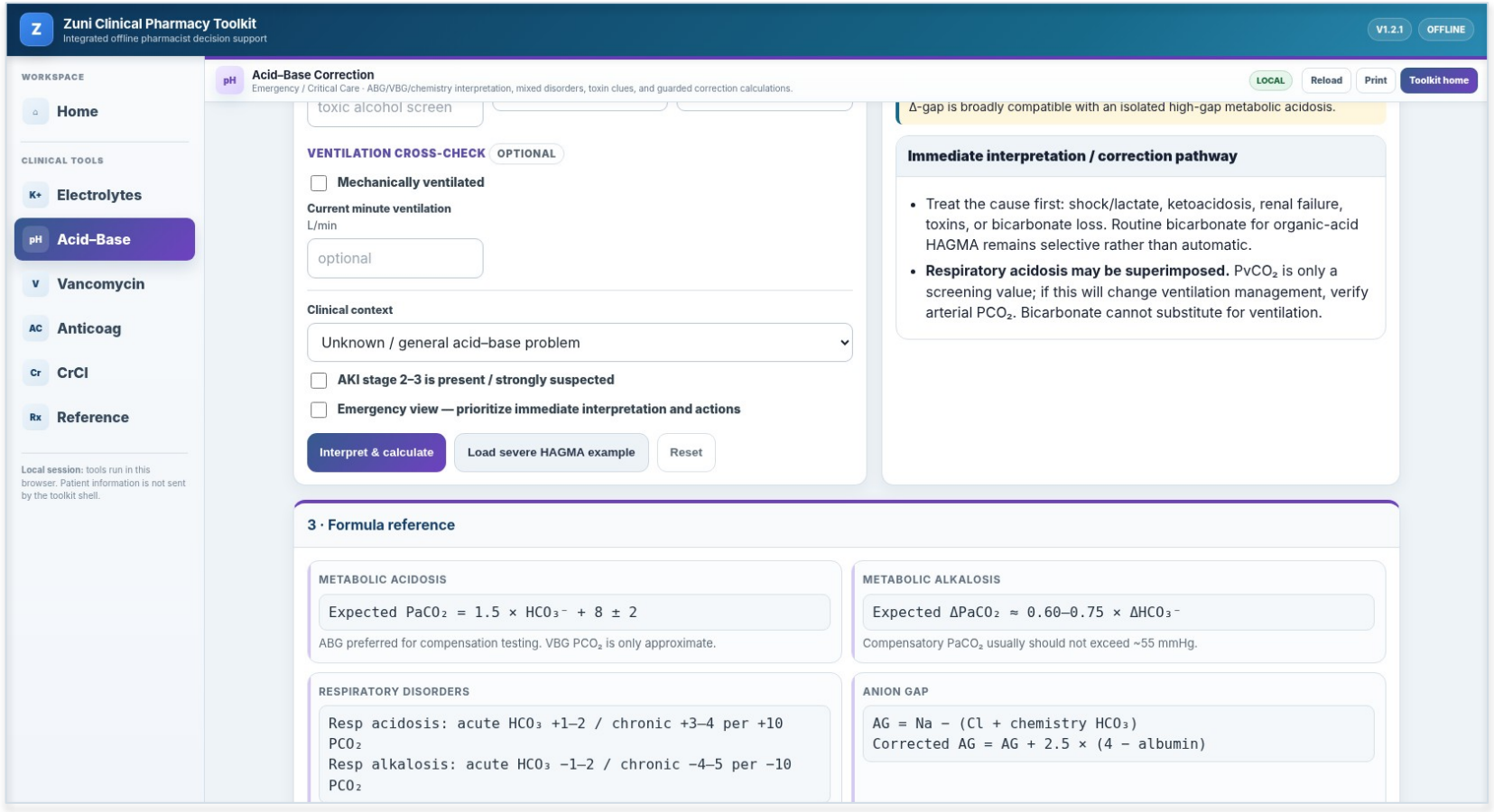
Clinical limits still govern

Tidal-volume limits, auto-PEEP, plateau pressure, ARDS strategy, and obstructive physiology remain outside the arithmetic.

6

VBG mode: useful, but intentionally less certain for PCO_2

The interface relabels the gas and tempers respiratory conclusions rather than treating $PvCO_2$ as exact $PaCO_2$.



1

pH and bicarbonate

Venous values can still support the acid–base assessment.

2

PCO_2 is approximate

The tool explicitly marks expected compensation as approximate in VBG mode.

3

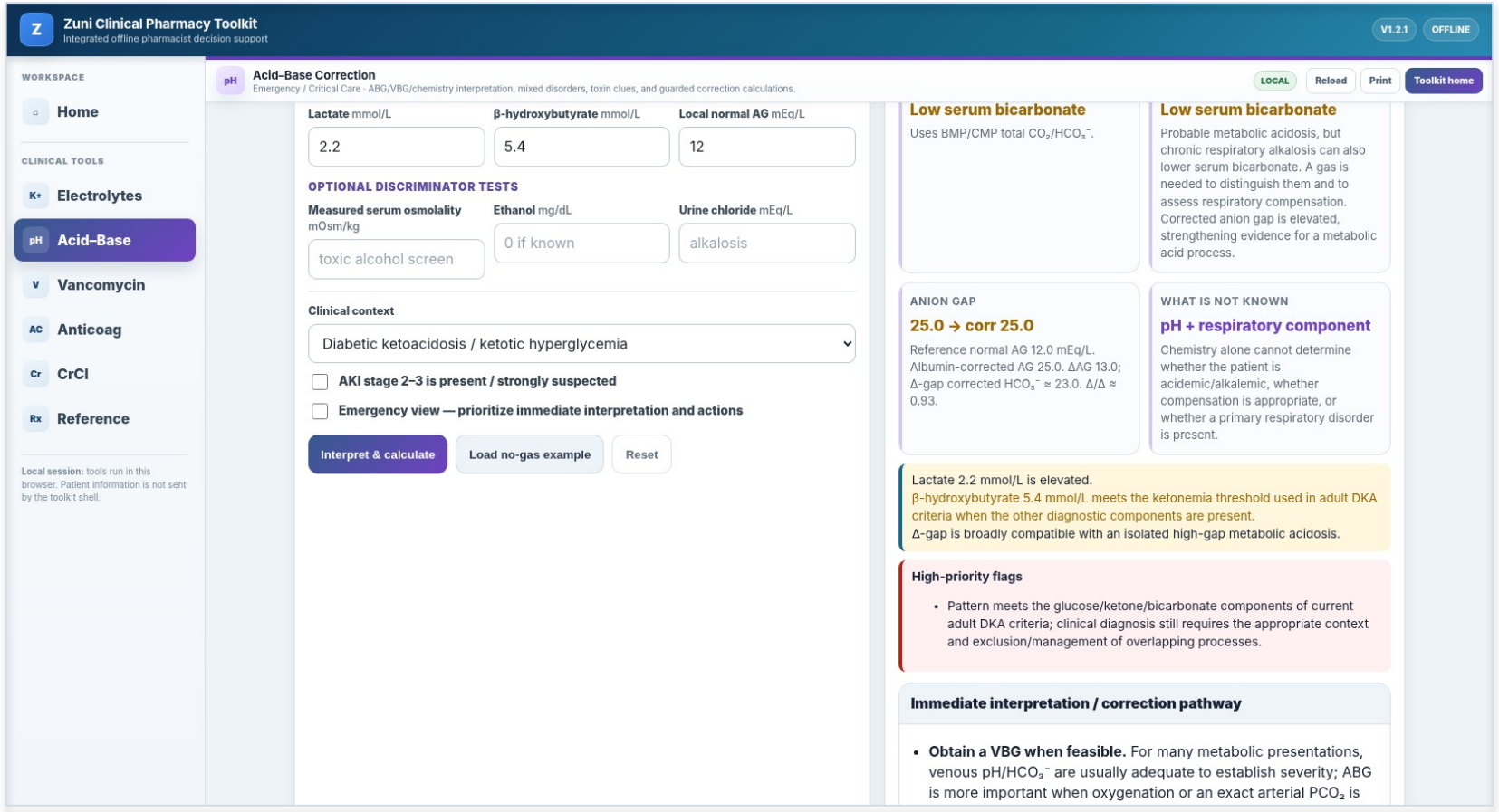
Escalate when it changes management

If exact arterial PCO_2 would change ventilation or rescue dosing, obtain an ABG.

7

Chemistry-only mode: know what is known and unknown

The gas fields disappear and the calculator refuses to infer pH or respiratory compensation.



1

Chemistry can establish

Bicarbonate direction, anion gap, albumin correction, ketone/lactate clues, osmolal gap, and urine-chloride pattern.

2

Chemistry cannot establish

Actual pH, respiratory compensation/failure, primary respiratory disease, or a pH-targeted bicarbonate rescue dose.

3

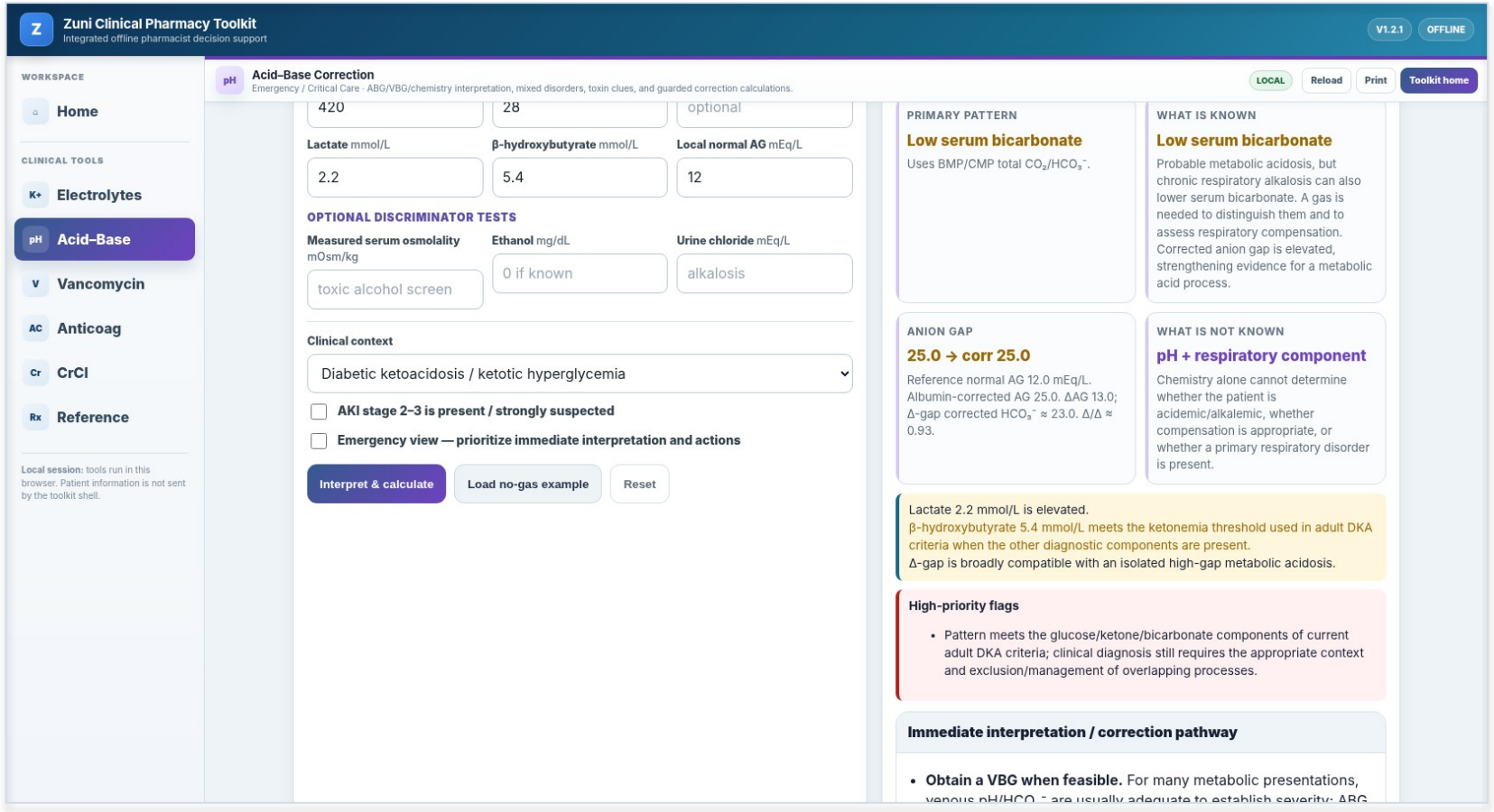
Use it as a screen

It helps characterize the metabolic problem while showing when a blood gas is still required.

8

Chemistry-only DKA example: integrate glucose, ketones, and bicarbonate

The built-in example populates hyperglycemia, β-hydroxybutyrate, low bicarbonate, and the DKA clinical context.



1 **Pattern recognition**

The output can recognize when the entered glucose/ketone/bicarbonate components match the current adult DKA pattern.

2 **Do not invent pH**

Even a convincing metabolic pattern does not permit pH-targeted bicarbonate dosing without a measured gas.

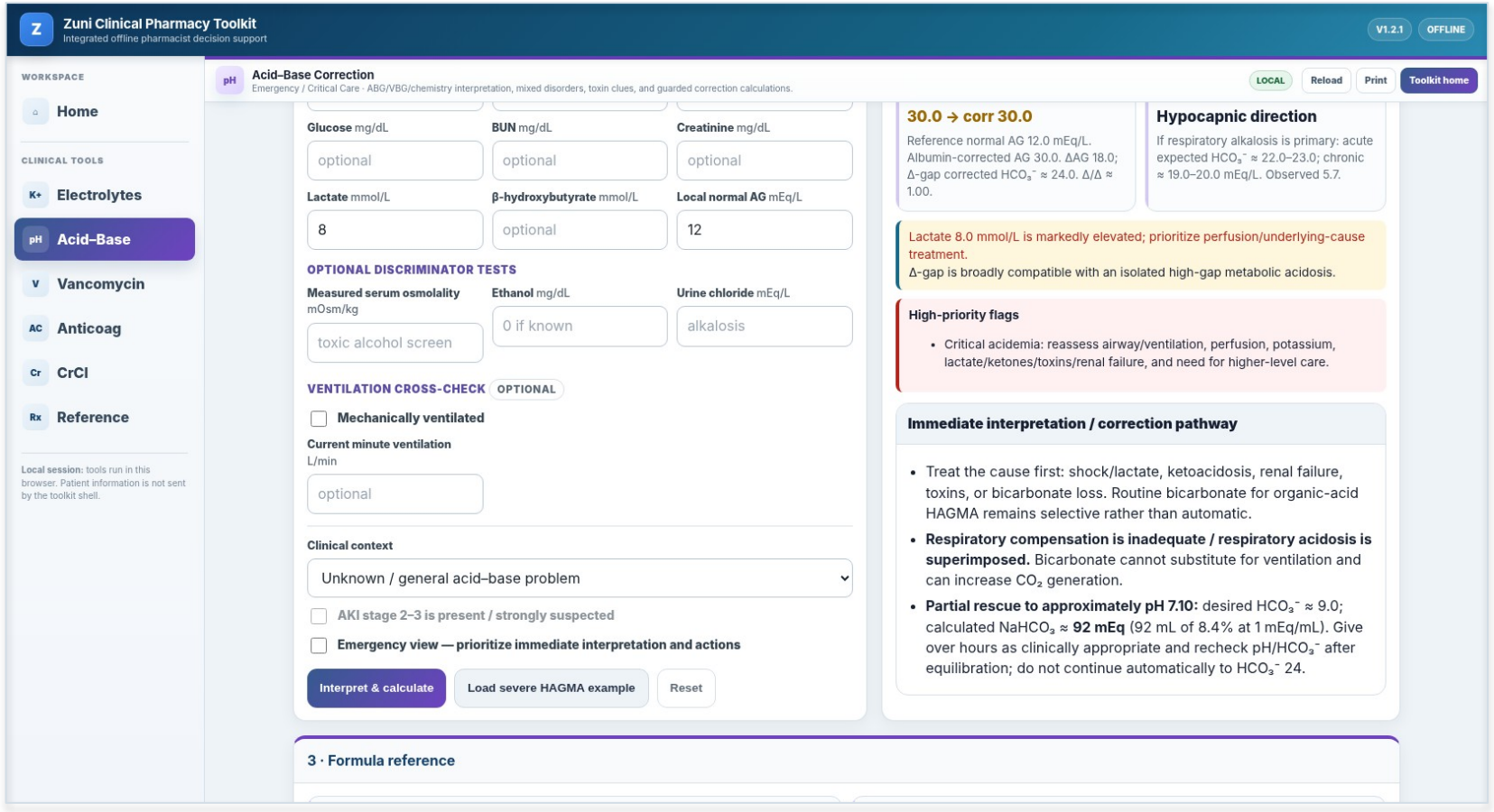
3 **Treat the source**

The DKA branch emphasizes fluids/insulin and reserves bicarbonate consideration for severe measured acidemia.

9

Anion gap, albumin correction, and mixed-metabolic clues

Use chemistry HCO_3^- for the gap calculation; albumin and the local normal AG refine interpretation.



1

Anion gap

AG = Na − (Cl + chemistry HCO_3^-).

2

Correct for albumin

Corrected AG = AG + 2.5 × (4 − albumin).

3

Δ-gap tools

When the corrected AG is elevated, the tool calculates ΔAG, corrected HCO_3^-, and Δ/Δ when applicable.

4

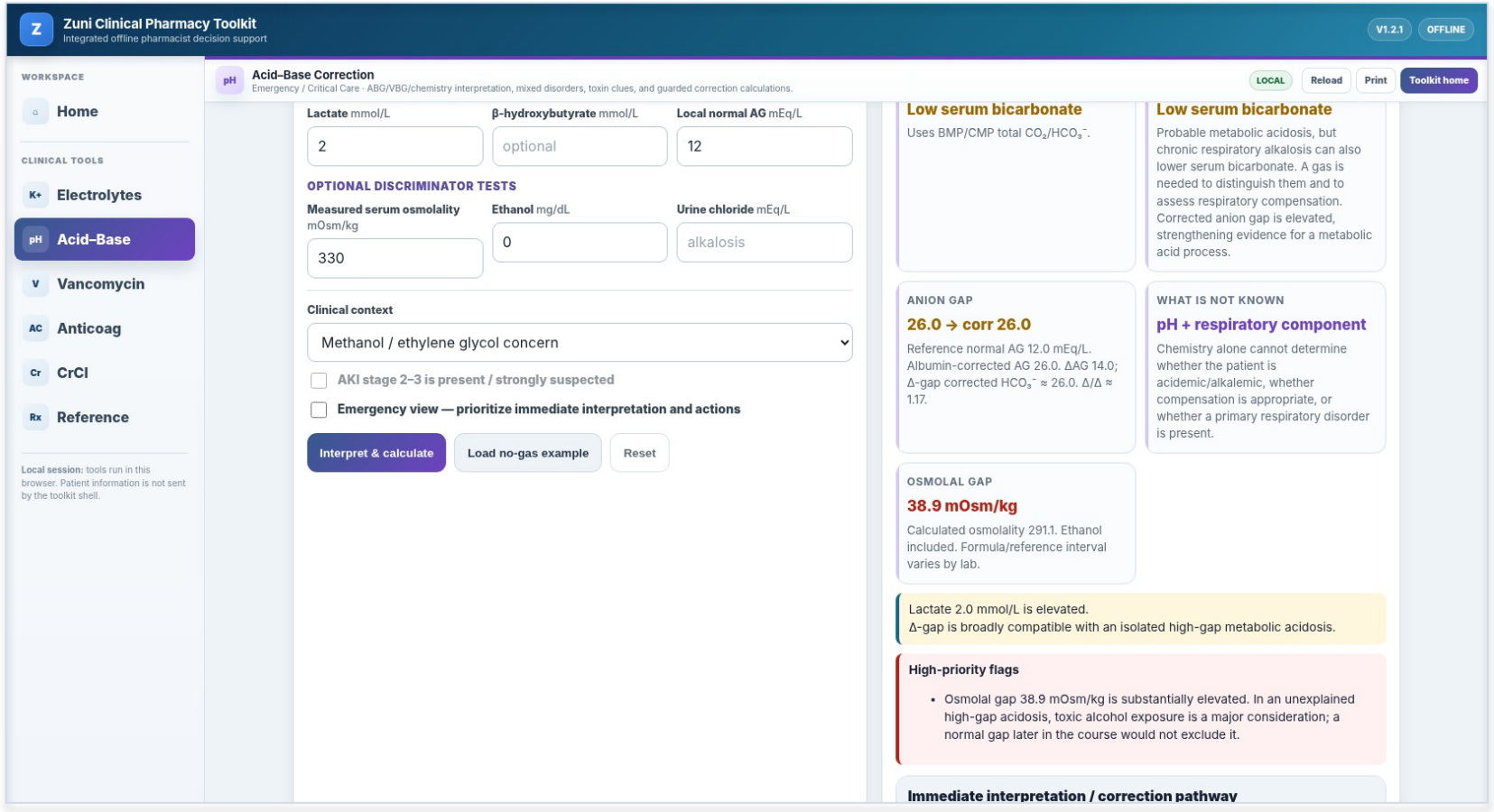
Use the local normal

The default normal AG is 12 mEq/L, but the field is editable for the local laboratory reference.

10

Osmolal gap: add toxin-screening data when the history fits

Measured osmolality and ethanol are optional discriminator inputs; the tool calculates the gap and keeps its limitations visible.



1

Enter measured osmolality

Calculated osmolality uses Na, glucose, BUN, and ethanol when supplied.

2

Interpret the gap in context

The result is a clue, not a stand-alone diagnosis; formula/reference intervals vary by lab.

3

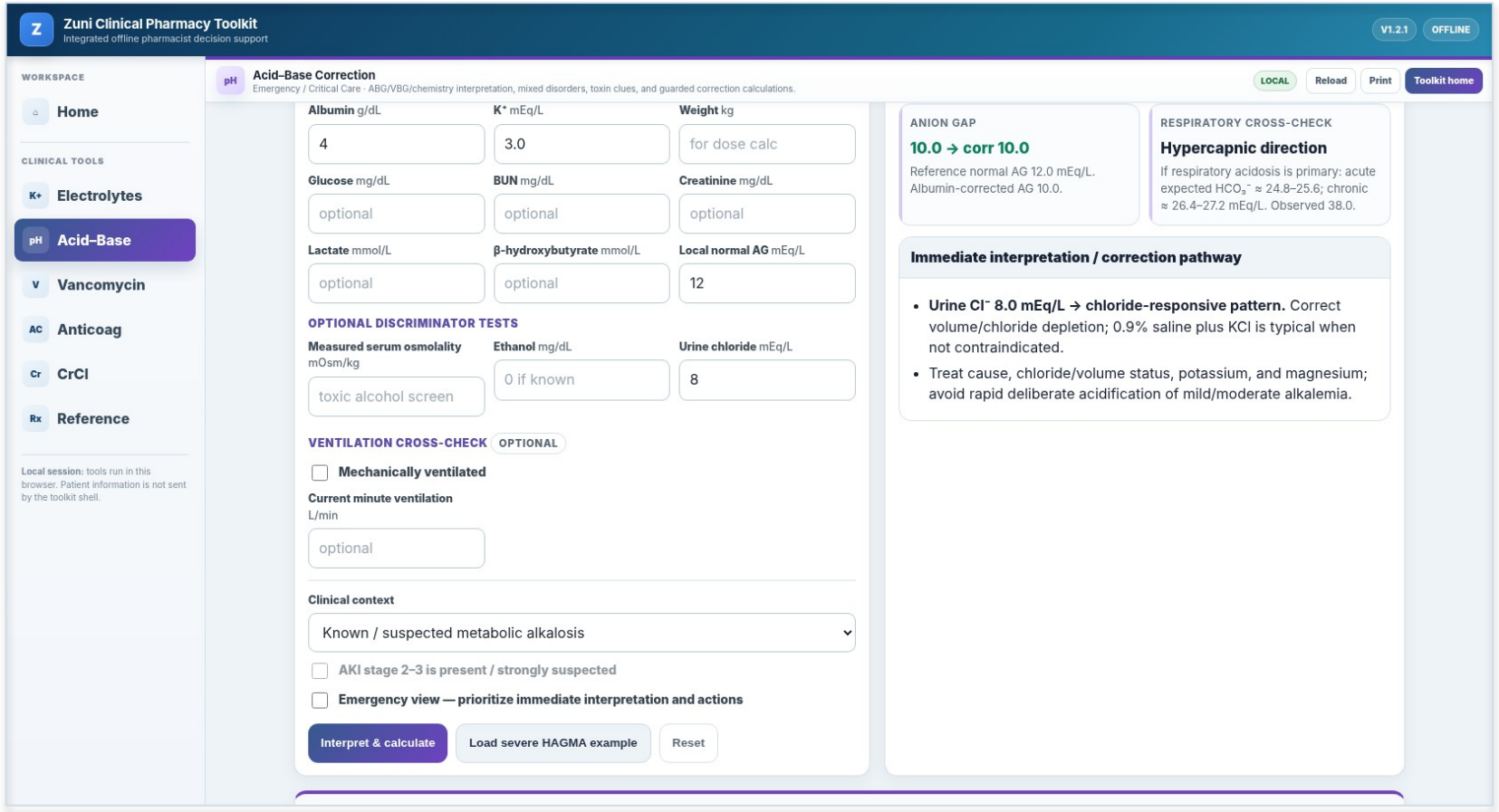
Normal does not exclude late poisoning

The tool explicitly warns that anion and osmolal gaps are time-dependent in toxic alcohol presentations.

11

Metabolic alkalosis: use urine chloride as a discriminator

The alkalosis branch combines the gas pattern with urine chloride when it is available.



1

Confirm the pattern

The gas and bicarbonate identify the alkalemic metabolic process and expected respiratory compensation.

2

Urine chloride <20

The formula reference labels this as a chloride-responsive pattern.

3

Urine chloride >20

The formula reference labels this as a chloride-unresponsive pattern.

4

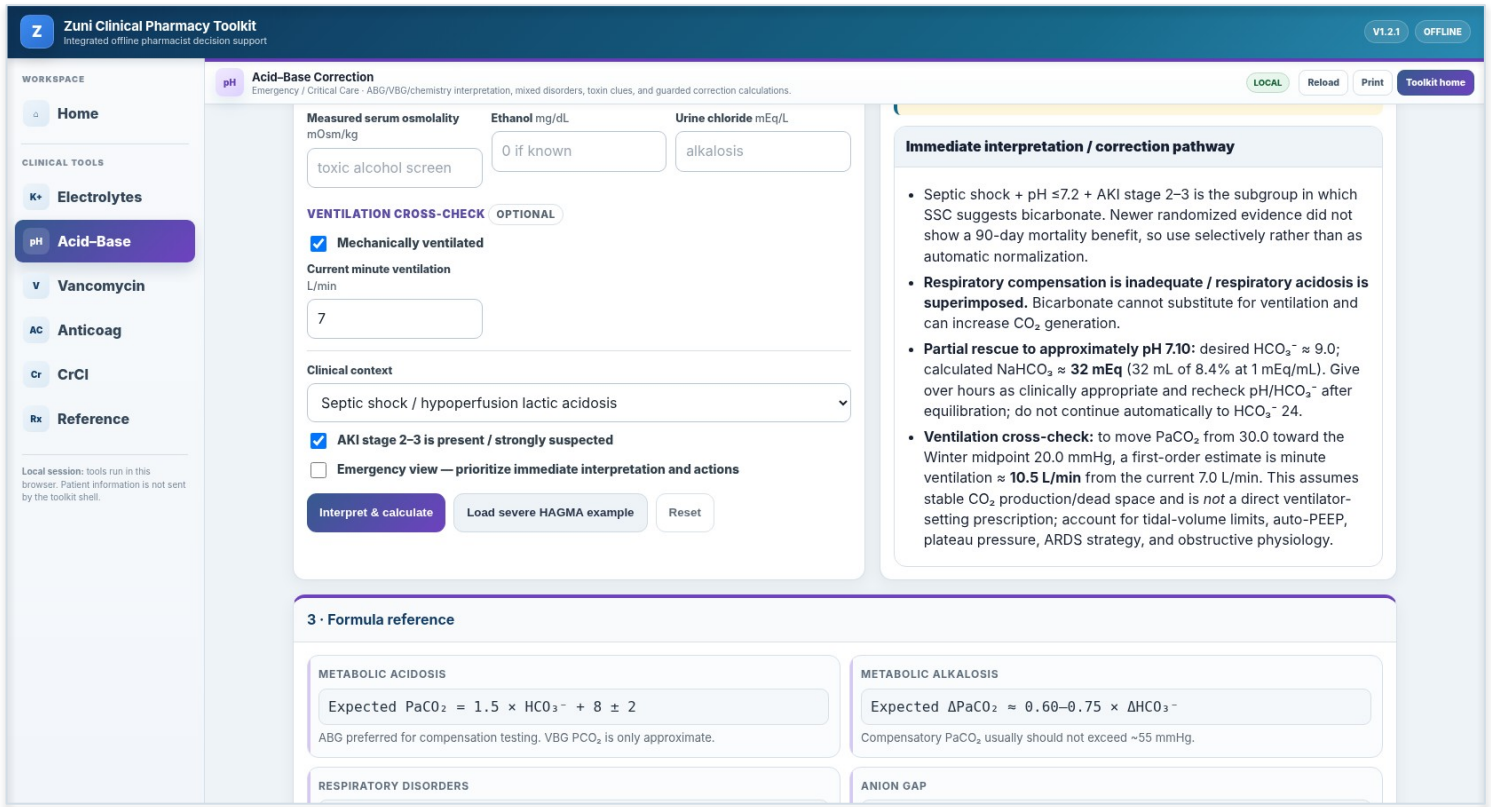
Still interpret clinically

Volume status, diuretics, BP, potassium, and renal function remain necessary context.

12

Clinical context changes the treatment branch

The calculator does not use one bicarbonate recommendation for every metabolic acidosis.



NAGMA — Bicarbonate-loss acidosis: replacement is physiologically direct; correct source, volume, and K.

DKA — Routine bicarbonate is not recommended when measured pH is ≥7.0.

Sepsis — Cause/perfusion first; severe acidemia + AKI 2–3 is handled as a specific subgroup.

Salicylate — Alkalinization strategy—not simple deficit replacement; preserve compensatory hyperventilation.

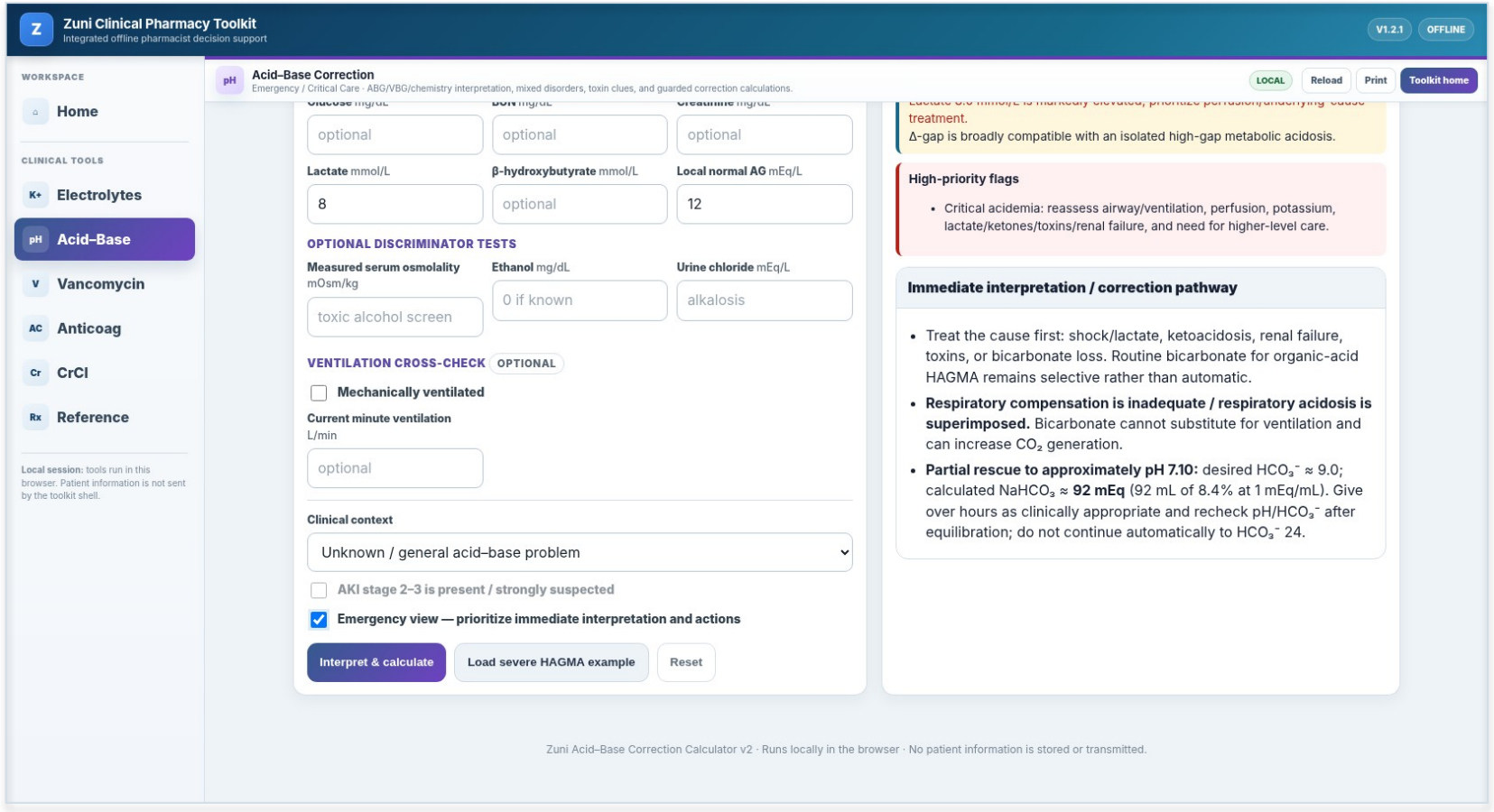
Toxic alcohol — Gaps support suspicion but do not rule in/out; toxicology/antidote/dialysis assessment is time-sensitive.

CKD — Chronic alkali-replacement context with monitoring for sodium/fluid load and overcorrection.

13

Emergency view: reduce visual noise without changing the calculation

Emergency view hides technical detail and prioritizes immediate interpretation and actions.



1

Same underlying calculation

The toggle changes presentation, not the clinical logic.

2

Fewer technical panels

Known/unknown explanatory boxes and formula-heavy details are suppressed.

3

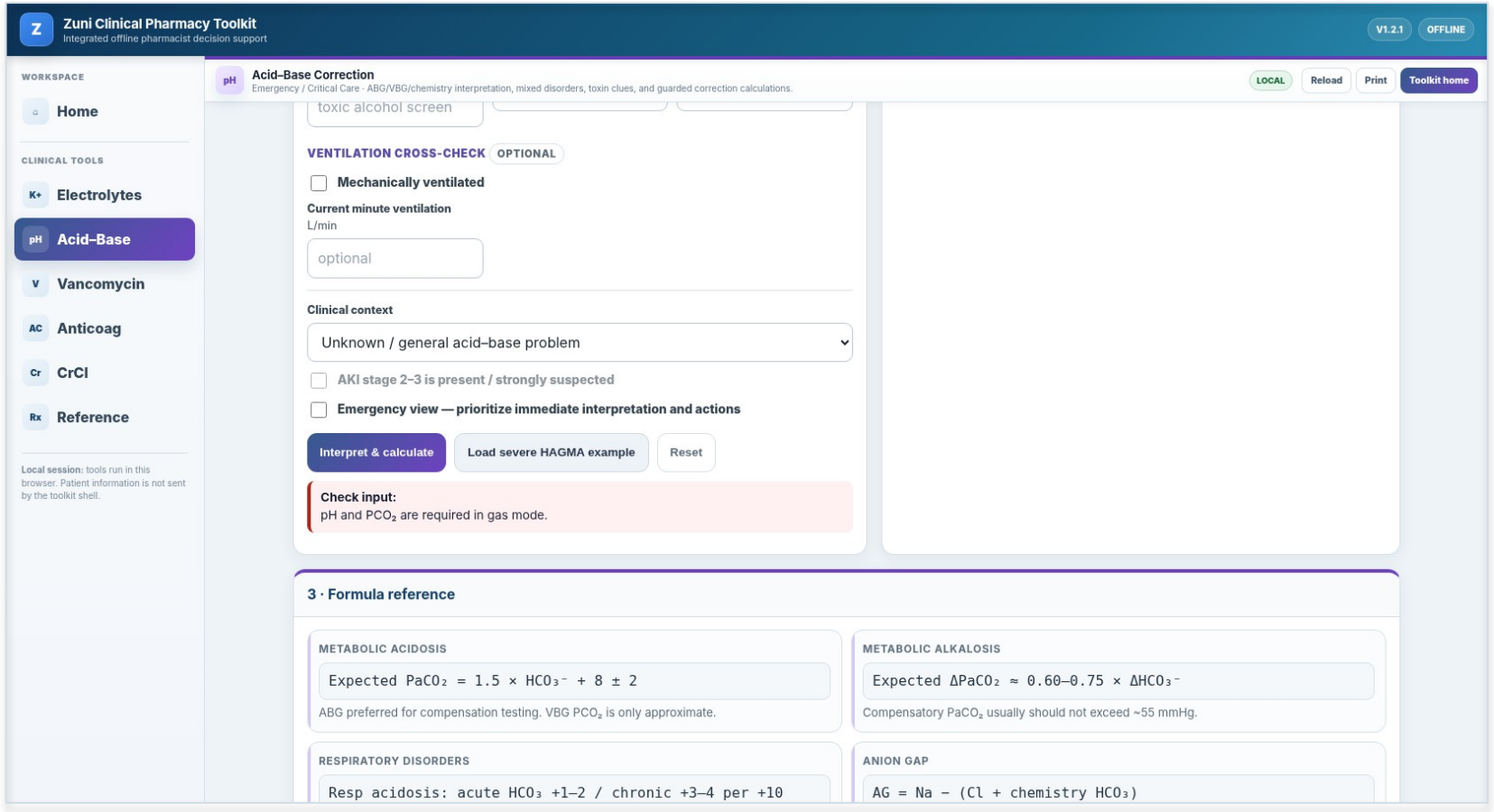
Use when speed matters

Switch it on during an acute workflow; switch it off when reviewing the reasoning or teaching.

14

Input validation: incomplete data should stop the workflow

The calculator shows a visible validation message rather than manufacturing a result from insufficient inputs.



1

Mode-specific requirements

ABG/VBG interpretation needs the gas values required for that mode.

2

Chemistry requirements differ

Chemistry-only mode can proceed without gas values but still needs the chemistry inputs for the calculation being requested.

3

Correct the missing data

Use the validation message as a prompt to complete the dataset—not as permission to estimate the missing value.

15

Formula reference: audit the math behind the output

The technical section keeps the core equations visible for teaching and verification.



1

Compensation formulas

Winter’s formula, metabolic alkalosis compensation, and acute/chronic respiratory rules are shown.

2

Gap calculations

Anion gap, albumin correction, and osmolal-gap arithmetic are documented.

3

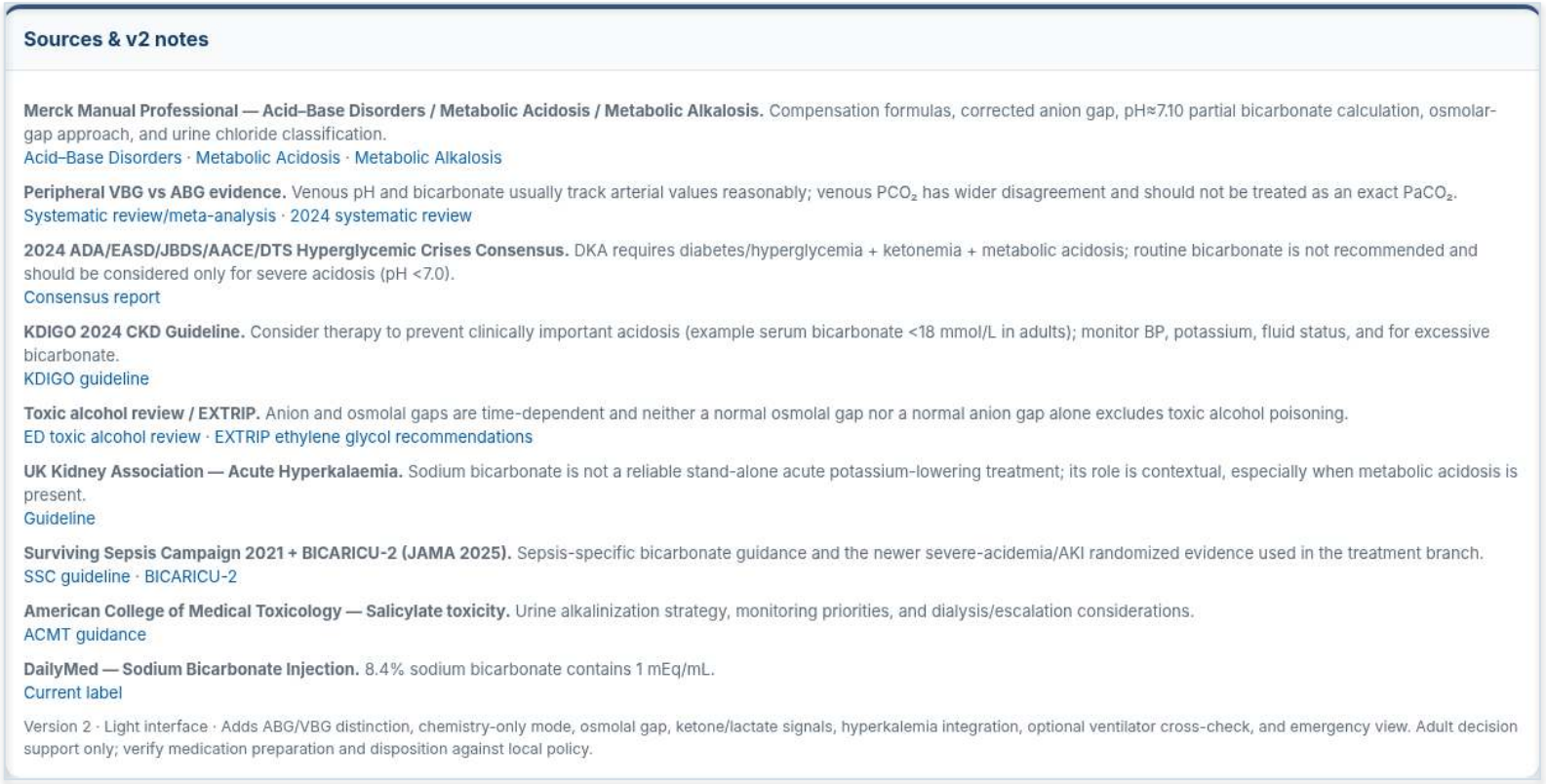
Correction tools

Partial bicarbonate rescue, ventilation estimate, and urine-chloride thresholds are explicit.

16

Sources & v2 notes: know where the branches came from

The module documents the references used for formulas, VBG limitations, DKA, CKD, toxins, sepsis, salicylates, and bicarbonate labeling.



Sources & v2 notes

Merck Manual Professional — Acid–Base Disorders / Metabolic Acidosis / Metabolic Alkalosis. Compensation formulas, corrected anion gap, pH≈7.10 partial bicarbonate calculation, osmolar-gap approach, and urine chloride classification.
Acid–Base Disorders · Metabolic Acidosis · Metabolic Alkalosis

Peripheral VBG vs ABG evidence. Venous pH and bicarbonate usually track arterial values reasonably; venous PCO_2 has wider disagreement and should not be treated as an exact $PaCO_2$.
Systematic review/meta-analysis · 2024 systematic review

2024 ADA/EASD/JBDS/AACE/DTS Hyperglycemic Crises Consensus. DKA requires diabetes/hyperglycemia + ketonemia + metabolic acidosis; routine bicarbonate is not recommended and should be considered only for severe acidosis (pH <7.0).
Consensus report

KDIGO 2024 CKD Guideline. Consider therapy to prevent clinically important acidosis (example serum bicarbonate <18 mmol/L in adults); monitor BP, potassium, fluid status, and for excessive bicarbonate.
KDIGO guideline

Toxic alcohol review / EXTRIP. Anion and osmolal gaps are time-dependent and neither a normal osmolal gap nor a normal anion gap alone excludes toxic alcohol poisoning.
ED toxic alcohol review · EXTRIP ethylene glycol recommendations

UK Kidney Association — Acute Hyperkalaemia. Sodium bicarbonate is not a reliable stand-alone acute potassium-lowering treatment; its role is contextual, especially when metabolic acidosis is present.
Guideline

Surviving Sepsis Campaign 2021 + BICARICU-2 (JAMA 2025). Sepsis-specific bicarbonate guidance and the newer severe-acidemia/AKI randomized evidence used in the treatment branch.
SSC guideline · BICARICU-2

American College of Medical Toxicology — Salicylate toxicity. Urine alkalinization strategy, monitoring priorities, and dialysis/escalation considerations.
ACMT guidance

DailyMed — Sodium Bicarbonate Injection. 8.4% sodium bicarbonate contains 1 mEq/mL.
Current label

Version 2 · Light interface · Adds ABG/VBG distinction, chemistry-only mode, osmolal gap, ketone/lactate signals, hyperkalemia integration, optional ventilator cross-check, and emergency view. Adult decision support only; verify medication preparation and disposition against local policy.

1

Reference families

Merck, systematic VBG evidence, DKA consensus, KDIGO, toxicology/EXTRIP, UK Kidney, SSC/BICARICU-2, ACMT, and DailyMed.

2

Why this matters

The calculator combines diagnostic math with context-specific treatment language; source review helps distinguish the two.

3

Local verification still applies

Adult decision support only; medication preparation and disposition still require active local policy and pharmacist verification.

Acid–Base: complete workflow

Use the calculator to structure the interpretation—not to replace the missing physiology.

1

Choose mode

ABG vs VBG vs chemistry-only

2

Enter data

Gas, chemistry, discriminator tests, ventilation

3

Set context

DKA, sepsis, toxins, CKD, NAGMA, alkalosis

4

Interpret

Primary pattern → compensation → gaps → warnings

5

Act & verify

Use guarded correction tools; confirm patient, source, and policy

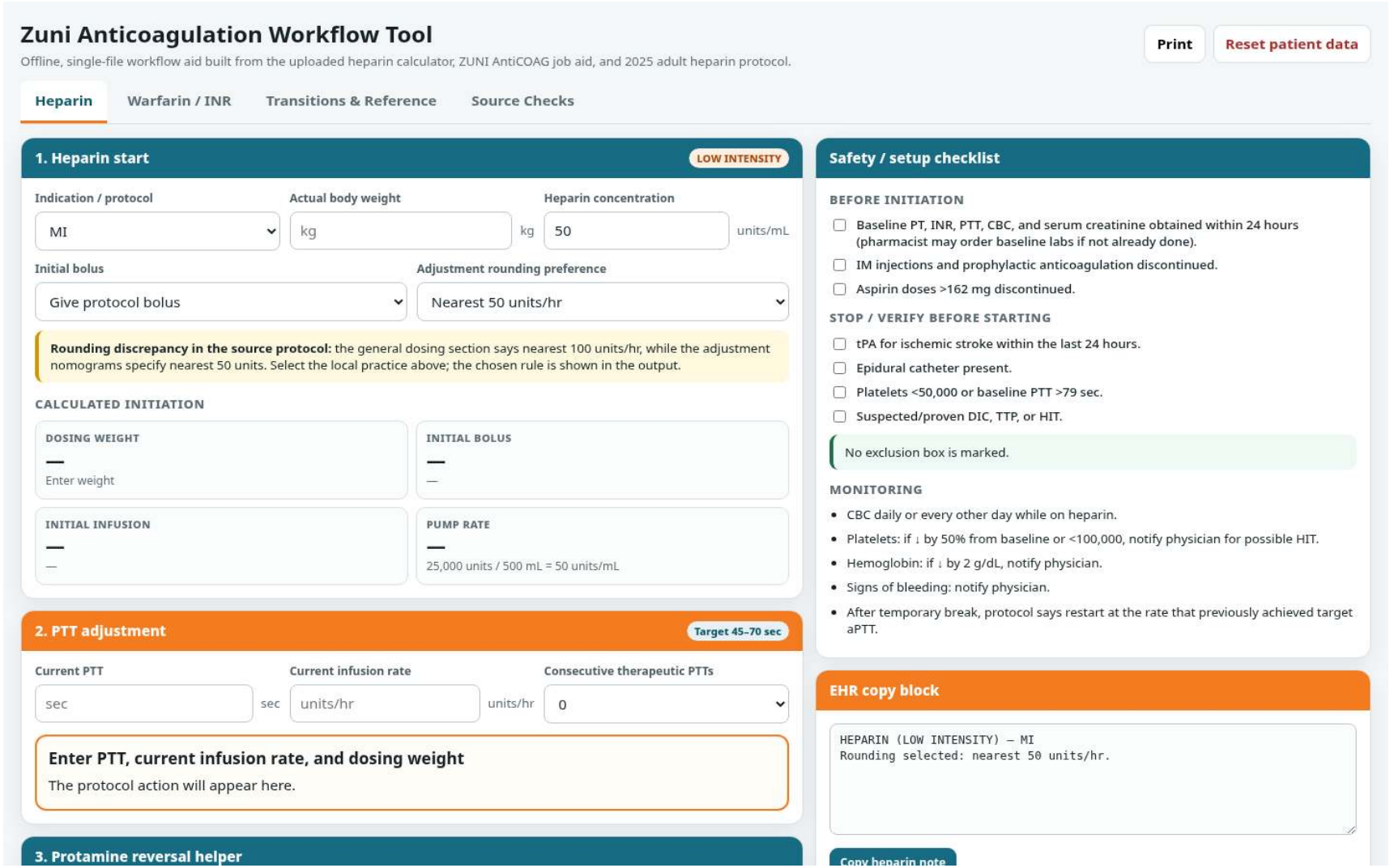
Key guardrail: chemistry-only data can characterize the metabolic component, but cannot establish pH, respiratory compensation, or a safe pH-targeted bicarbonate rescue dose.

Anticoagulation Workflow Tool

Comprehensive ZSURx Tutorial

Train coworkers on IV heparin initiation and adjustment, protamine support, warfarin INR management, weekly regimen planning, transitions, and source-discrepancy safeguards.

Open the tool and choose the correct workflow tab



1 — Four major areas

Heparin, Warfarin/INR, Transitions & Reference, and Source Checks are separate workflows.

2 — Heparin starts active

The default tab supports infusion initiation, PTT adjustment, reversal, checklist, and EHR copy block.

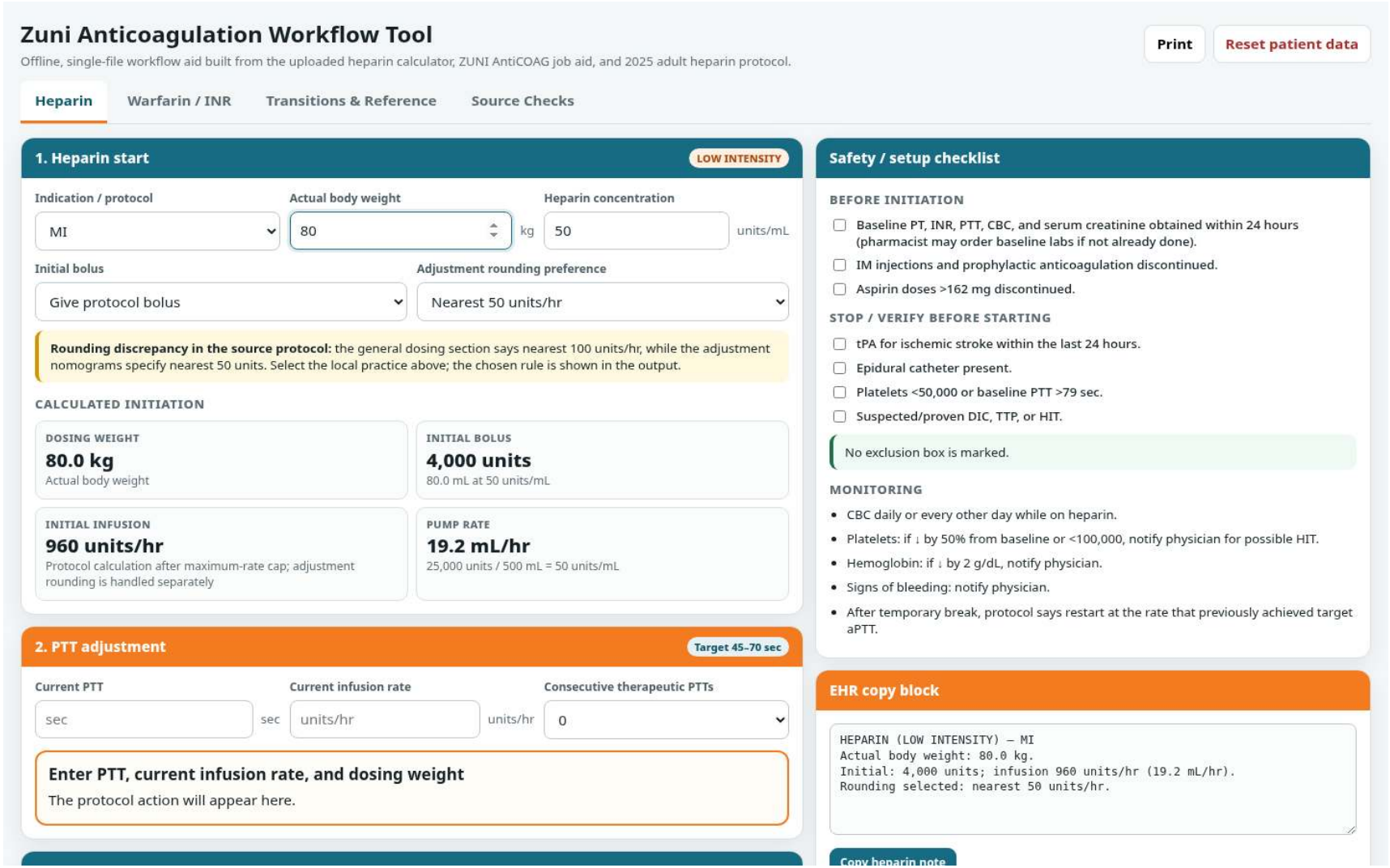
3 — Reset is patient-specific

Reset patient data clears entries but preserves non-patient preferences such as rounding settings.

4 — Use the right branch

Do not use heparin PTT logic for warfarin INR management or vice versa.

Heparin start: low-intensity protocols use actual weight by default



1 — Choose indication/protocol

The indication determines the low- vs moderate-intensity pathway and target PTT range.

2 — Enter actual body weight

For low-intensity protocols the calculated initiation uses the actual body weight entered.

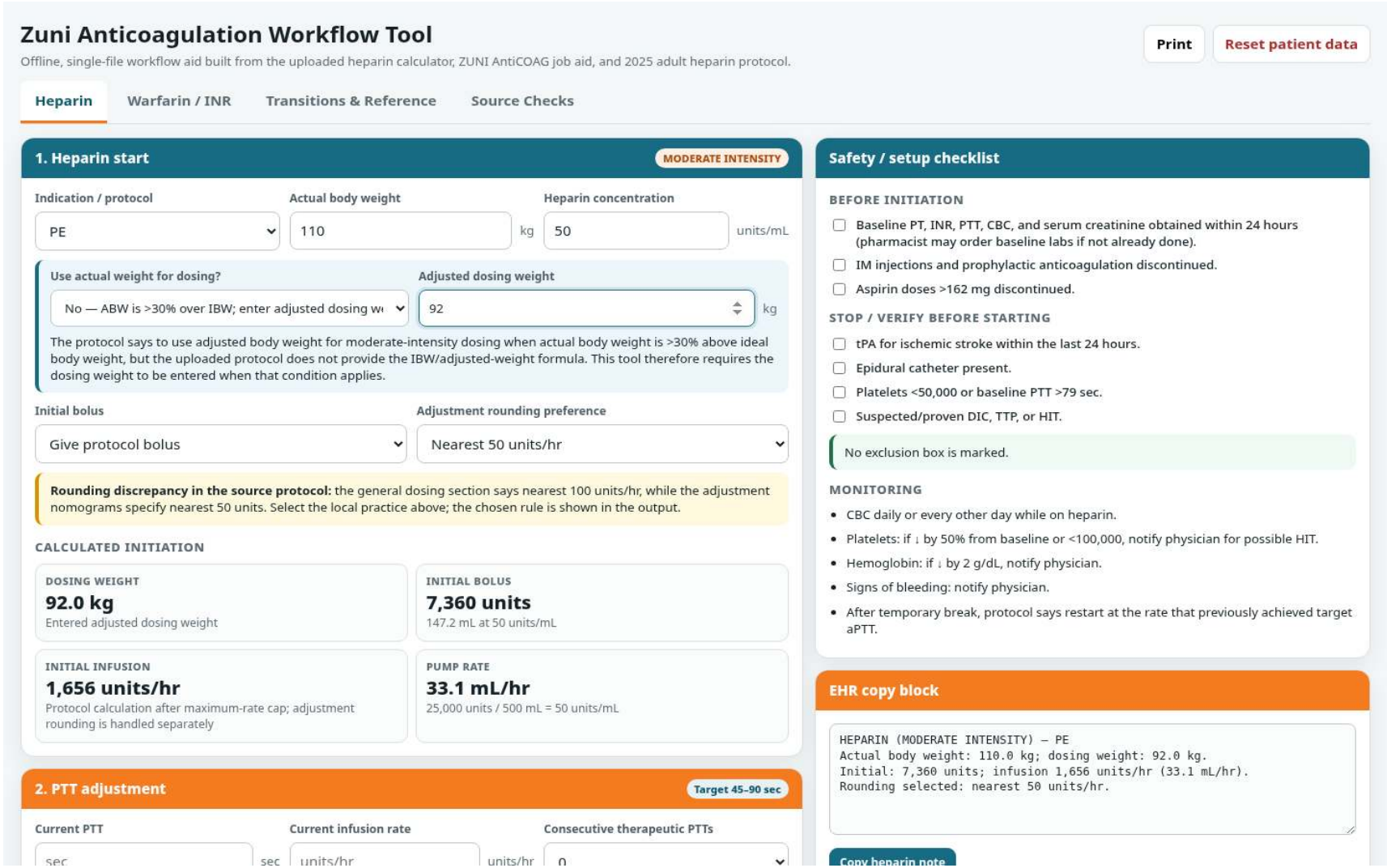
3 — Output is order-ready arithmetic

The calculator displays dosing weight, bolus, units/hr, and mL/hr using 50 units/mL.

4 — Bolus can be suppressed

When clinically required, select No initial bolus rather than editing the calculated rate manually.

Moderate intensity: adjusted dosing weight may be required



1 — Moderate intensity shown

PE is rendered here as a moderate-intensity example with target 45–90 sec.

2 — Adjusted weight is entered manually

When ABW is >30% over IBW, the protocol says to use adjusted dosing weight but does not define the formula. The tool therefore requires

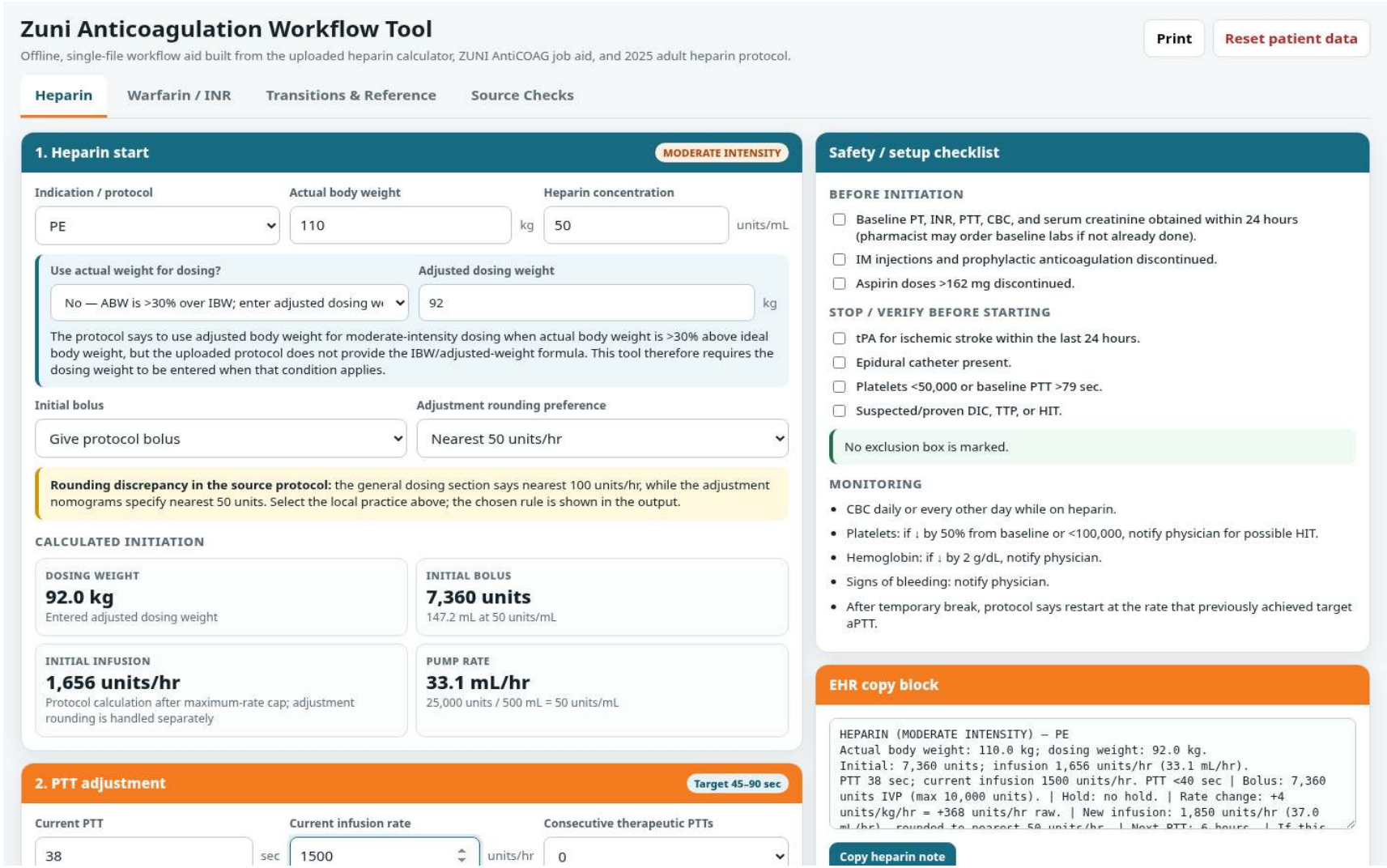
3 — Rounding discrepancy is exposed

The general dosing section and adjustment tables differ; the tool shows a selectable rounding preference instead of silently

4 — EHR note updates live

The copy block records protocol intensity, dosing weight, bolus, rate, and rounding selection.

PTT adjustment: use the current PTT and current infusion rate



1 — Enter current PTT

The adjustment table changes with low- vs moderate-intensity protocol.

2 — Enter current rate

The recommendation is a change from the current units/hr, not a new start calculation.

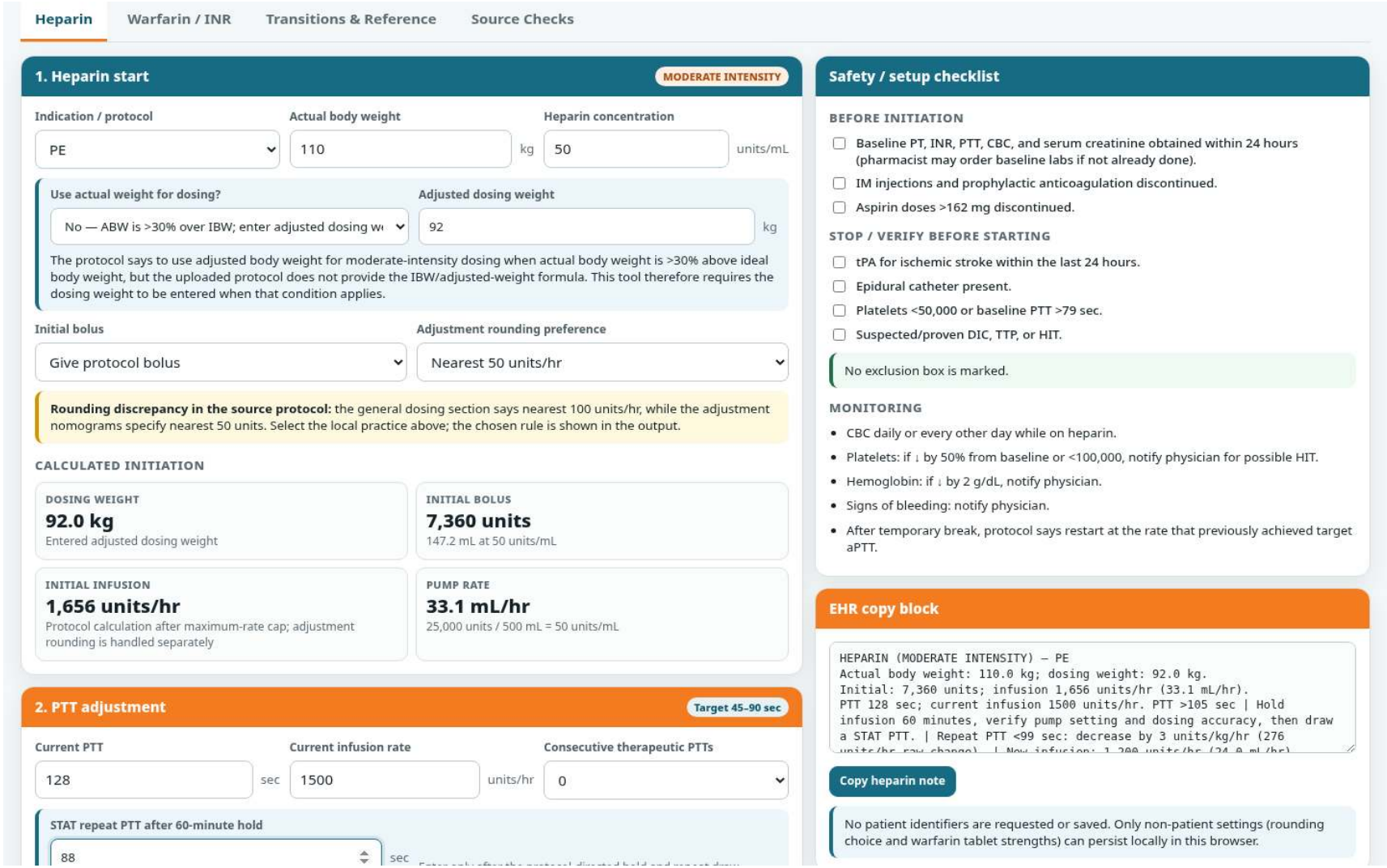
3 — Therapeutic count matters

Consecutive therapeutic PTTs affect monitoring frequency and documentation.

4 — Round visibly

The selected nearest-50 or nearest-100 rule affects the adjusted rate and remains visible in the note.

Very high PTT: the tool supports the hold-and-repeat branch



1 — Initial high PTT triggers a branch

For very high values, the protocol can require holding the infusion and obtaining a STAT repeat PTT.

2 — Repeat PTT is entered separately

Do not replace the original PTT; enter the post-hold repeat in the dedicated field.

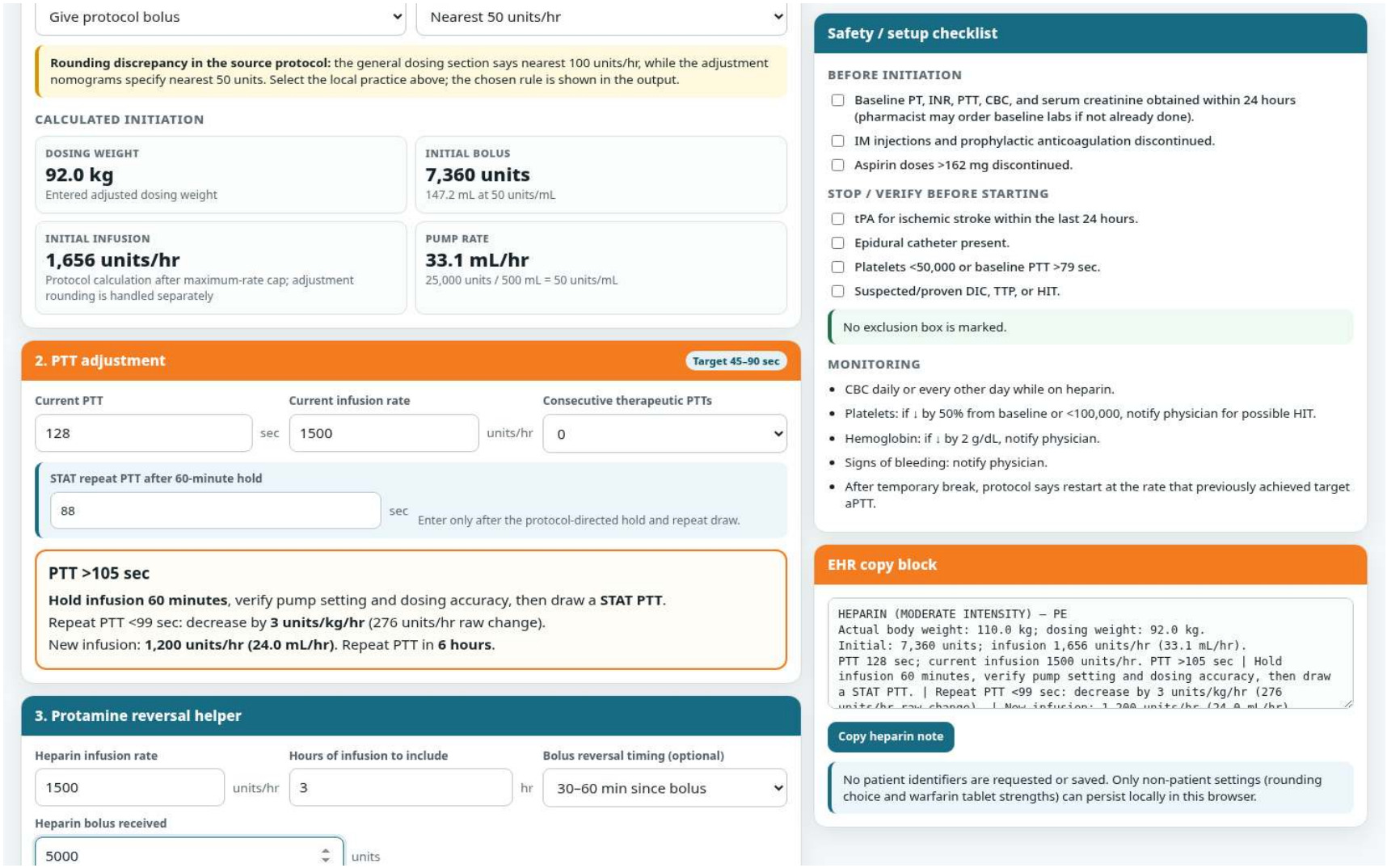
3 — Action updates after repeat

The recommendation recalculates from the repeat value and current-rate context.

4 — Timing is clinical context

The calculator helps apply the table; it does not verify that the hold and repeat draw happened correctly.

Protamine helper: estimate reversal from recent infusion and bolus exposure



1 **Infusion component**

Enter the infusion rate and hours to include; the helper estimates units of heparin exposure from the recent infusion.

2 **Optional bolus component**

If a bolus was given, select timing and enter bolus units so the estimate reflects residual bolus effect.

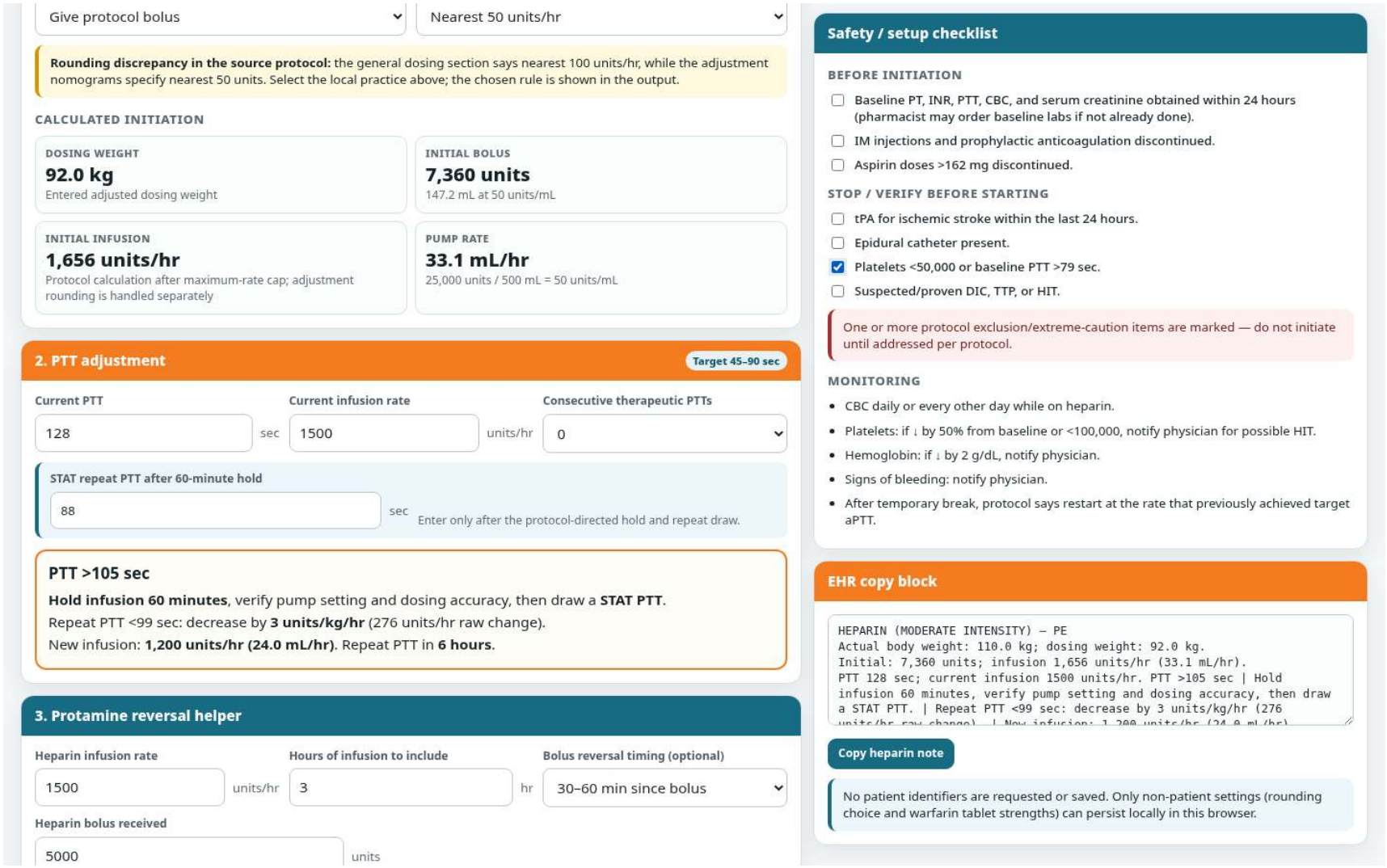
3 **Dose support, not autonomy**

Protamine decisions still require bleeding severity, time since heparin, risk of over-reversal, and local policy.

4 **Document the assumption**

The output should be interpreted with the exact hours and bolus timing used in the calculation.

Use the safety checklist before initiation and copy block after calculation



1 — Initiation checks

Baseline labs and contraindication-type checklist items are visible beside the dosing panel.

2 — Marked exclusions warn loudly

Checking tPA, epidural, severe thrombocytopenia/baseline PTT, DIC/TTP/HIT etc. changes the banner to an error.

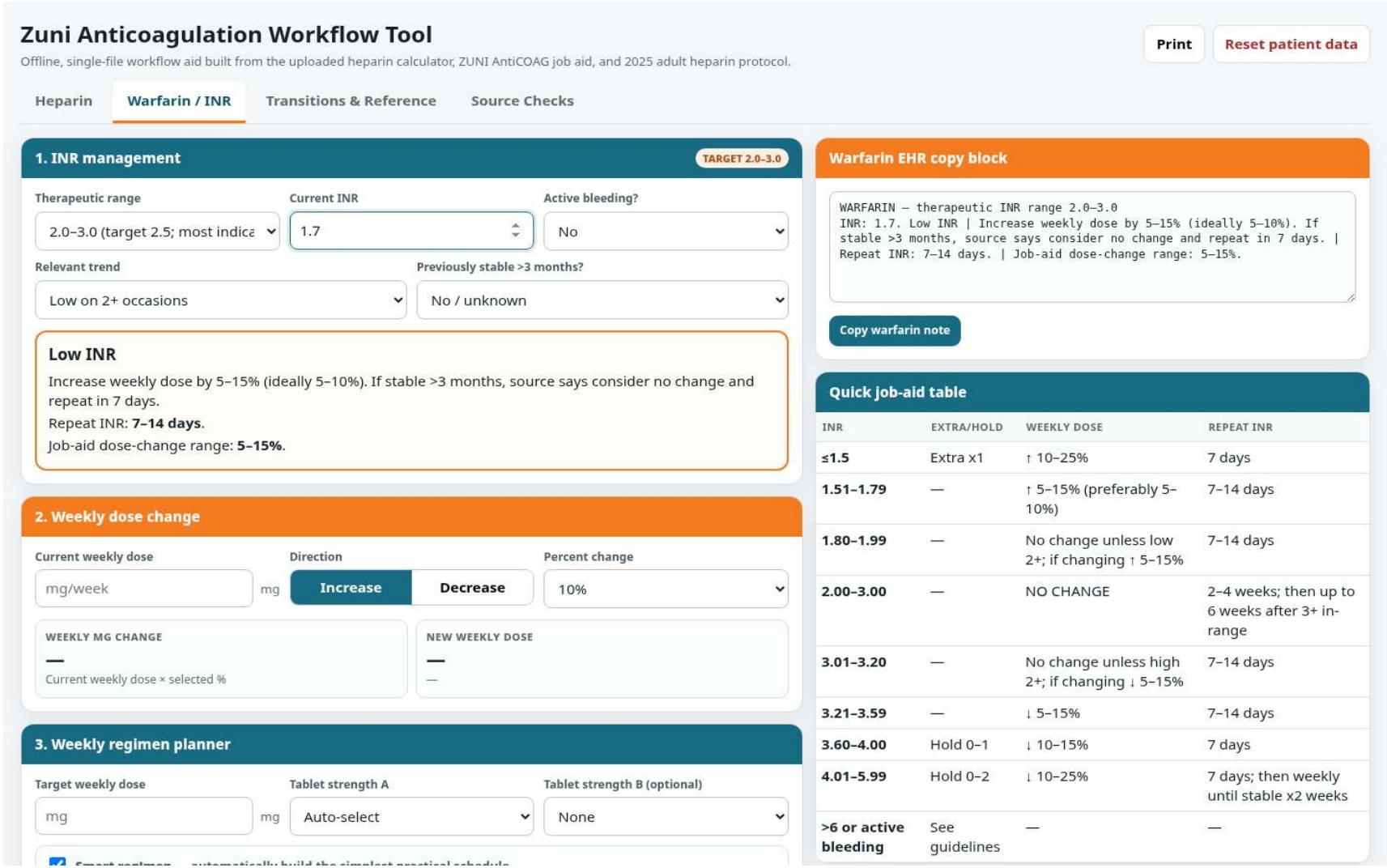
3 — EHR copy block

The live note summarizes intensity, protocol, weight, bolus, infusion, mL/hr, PTT adjustment, and safety flags.

4 — Do not use copy block blindly

Confirm the checklist, dose, and protocol before copying to the EHR.

Warfarin / INR: start with the target range and current INR



1 — Select therapeutic range

Choose 2.0–3.0 or 2.5–3.5 before interpreting the INR.

2 — Enter active bleeding status

Active bleeding overrides routine dose-adjustment logic and points toward guideline management.

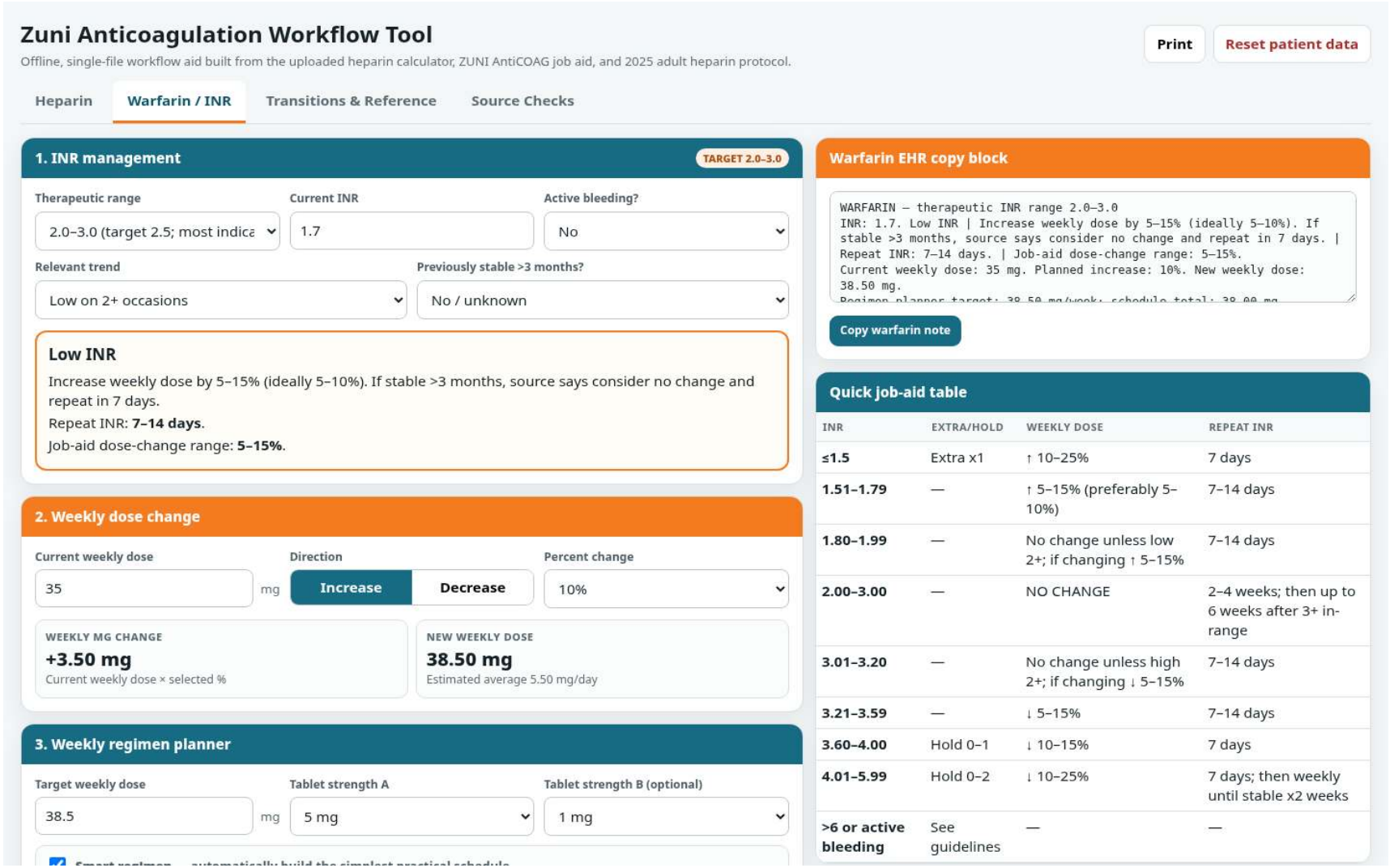
3 — Trend and stability modify language

Low/high on repeated occasions and stability >3 months affect whether no-change can be considered.

4 — Recommendation is job-aid based

The displayed action comes from the ZUNI AntiCOAG job aid logic in the tool.

Weekly dose change: convert the INR recommendation into a new weekly target



Zuni Anticoagulation Workflow Tool

Offline, single-file workflow aid built from the uploaded heparin calculator, ZUNI AntiCOAG job aid, and 2025 adult heparin protocol.

Print | Reset patient data

Heparin | Warfarin / INR | Transitions & Reference | Source Checks

1. INR management — TARGET 2.0–3.0

Therapeutic range: 2.0–3.0 (target 2.5; most indica)
Current INR: 1.7
Active bleeding?: No
Relevant trend: Low on 2+ occasions
Previously stable >3 months?: No / unknown

Low INR

Increase weekly dose by 5–15% (ideally 5–10%). If stable >3 months, source says consider no change and repeat in 7 days.
Repeat INR: **7–14 days**.
Job-aid dose-change range: **5–15%**.

2. Weekly dose change

Current weekly dose: 35 mg
Direction: Increase | Decrease
Percent change: 10%

WEEKLY MG CHANGE: **+3.50 mg** — Current weekly dose × selected %
NEW WEEKLY DOSE: **38.50 mg** — Estimated average 5.50 mg/day

3. Weekly regimen planner

Target weekly dose: 38.5 mg
Tablet strength A: 5 mg
Tablet strength B (optional): 1 mg

Warfarin EHR copy block

```
WARFARIN — therapeutic INR range 2.0–3.0
INR: 1.7. Low INR | Increase weekly dose by 5–15% (ideally 5–10%). If
stable >3 months, source says consider no change and repeat in 7 days. |
Repeat INR: 7–14 days. | Job-aid dose-change range: 5–15%.
Current weekly dose: 35 mg. Planned increase: 10%. New weekly dose:
38.50 mg.
Regimen planner target: 38.50 mg/week; schedule total: 38.00 mg
```

Copy warfarin note

Quick job-aid table

INR	EXTRA/HOLD	WEEKLY DOSE	REPEAT INR
≤1.5	Extra x1	↑ 10–25%	7 days
1.51–1.79	—	↑ 5–15% (preferably 5–10%)	7–14 days
1.80–1.99	—	No change unless low 2+; if changing ↑ 5–15%	7–14 days
2.00–3.00	—	NO CHANGE	2–4 weeks; then up to 6 weeks after 3+ in-range
3.01–3.20	—	No change unless high 2+; if changing ↓ 5–15%	7–14 days
3.21–3.59	—	↓ 5–15%	7–14 days
3.60–4.00	Hold 0–1	↓ 10–15%	7 days
4.01–5.99	Hold 0–2	↓ 10–25%	7 days; then weekly until stable x2 weeks
>6 or active bleeding	See guidelines	—	—

1 — Enter current weekly dose

Use the patient's total weekly warfarin dose, not a single daily dose.

2 — Choose direction and percent

Select increase/decrease and the chosen percent range from the job-aid recommendation.

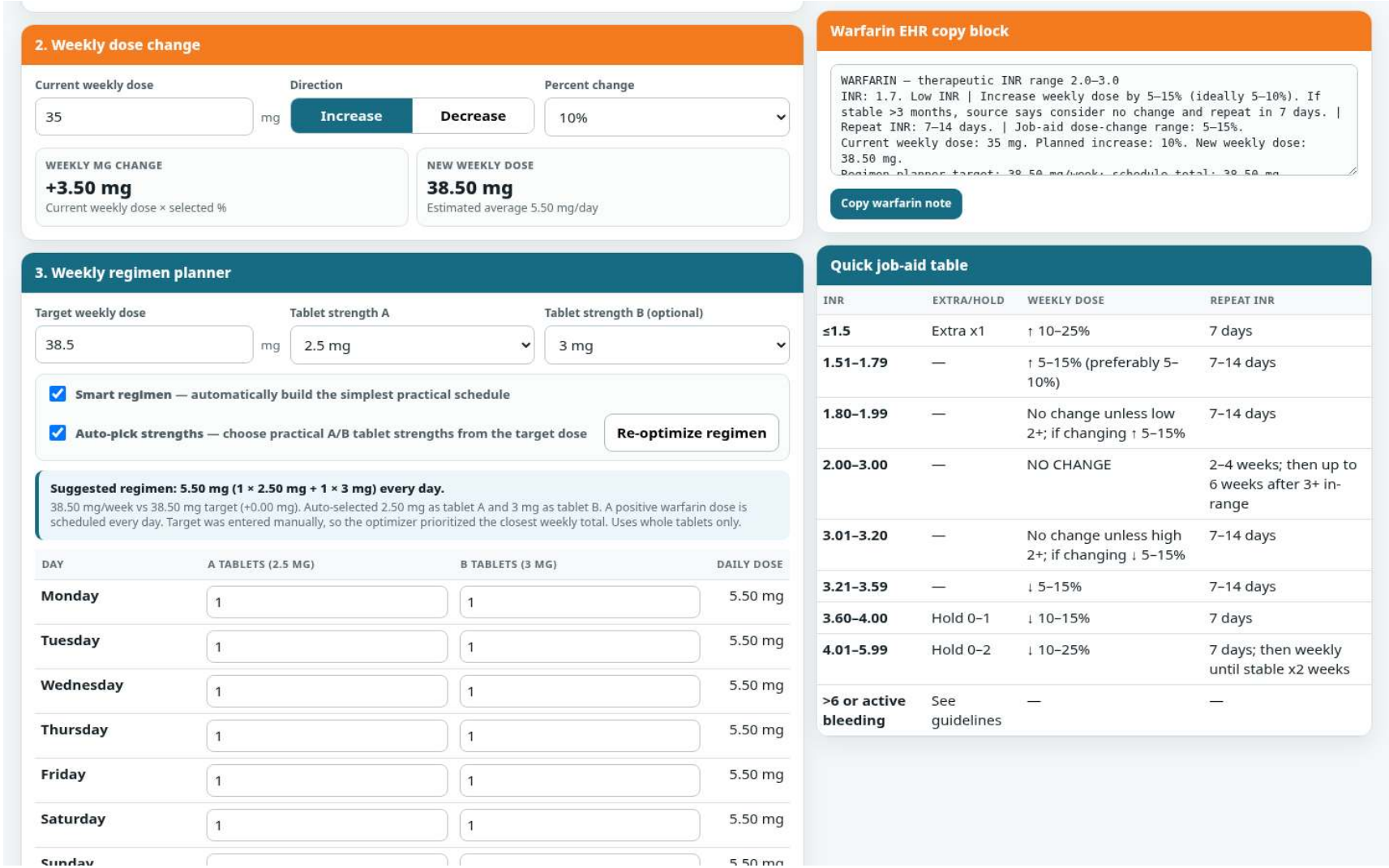
3 — Result becomes planner target

The new weekly dose is the target the weekly regimen planner will attempt to operationalize.

4 — Clinical judgment still required

The job aid provides a range; the chosen percentage should fit risk, trend, indication, and follow-up ability.

Weekly regimen planner: make the new weekly dose usable for a patient



2. Weekly dose change

Current weekly dose: 35 mg

Direction: Increase | Decrease

Percent change: 10%

WEEKLY MG CHANGE
+3.50 mg
Current weekly dose × selected %

NEW WEEKLY DOSE
38.50 mg
Estimated average 5.50 mg/day

3. Weekly regimen planner

Target weekly dose: 38.5 mg

Tablet strength A: 2.5 mg

Tablet strength B (optional): 3 mg

☑ **Smart regimen — automatically build the simplest practical schedule**

☑ **Auto-pick strengths — choose practical A/B tablet strengths from the target dose**

Re-optimize regimen

Suggested regimen: 5.50 mg (1 × 2.50 mg + 1 × 3 mg) every day.
38.50 mg/week vs 38.50 mg target (+0.00 mg). Auto-selected 2.50 mg as tablet A and 3 mg as tablet B. A positive warfarin dose is scheduled every day. Target was entered manually, so the optimizer prioritized the closest weekly total. Uses whole tablets only.

DAY	A TABLETS (2.5 MG)	B TABLETS (3 MG)	DAILY DOSE
Monday	1	1	5.50 mg
Tuesday	1	1	5.50 mg
Wednesday	1	1	5.50 mg
Thursday	1	1	5.50 mg
Friday	1	1	5.50 mg
Saturday	1	1	5.50 mg
Sunday			5.50 mg

Warfarin EHR copy block

```
WARFARIN — therapeutic INR range 2.0–3.0
INR: 1.7. Low INR | Increase weekly dose by 5–15% (ideally 5–10%). If
stable >3 months, source says consider no change and repeat in 7 days. |
Repeat INR: 7–14 days. | Job-aid dose-change range: 5–15%.
Current weekly dose: 35 mg. Planned increase: 10%. New weekly dose:
38.50 mg.
Regimen planner target: 38.50 mg/week; schedule total: 38.50 mg
```

Copy warfarin note

Quick job-aid table

INR	EXTRA/HOLD	WEEKLY DOSE	REPEAT INR
≤1.5	Extra x1	↑ 10–25%	7 days
1.51–1.79	—	↑ 5–15% (preferably 5–10%)	7–14 days
1.80–1.99	—	No change unless low 2+; if changing ↑ 5–15%	7–14 days
2.00–3.00	—	NO CHANGE	2–4 weeks; then up to 6 weeks after 3+ in-range
3.01–3.20	—	No change unless high 2+; if changing ↓ 5–15%	7–14 days
3.21–3.59	—	↓ 5–15%	7–14 days
3.60–4.00	Hold 0–1	↓ 10–15%	7 days
4.01–5.99	Hold 0–2	↓ 10–25%	7 days; then weekly until stable x2 weeks
>6 or active bleeding	See guidelines	—	—

1 Smart regimen

The optimizer tries to build a simple practical schedule using whole tablets when possible.

2 Auto-pick strengths

The tool can select practical tablet strengths from the target dose, or you can choose strengths manually.

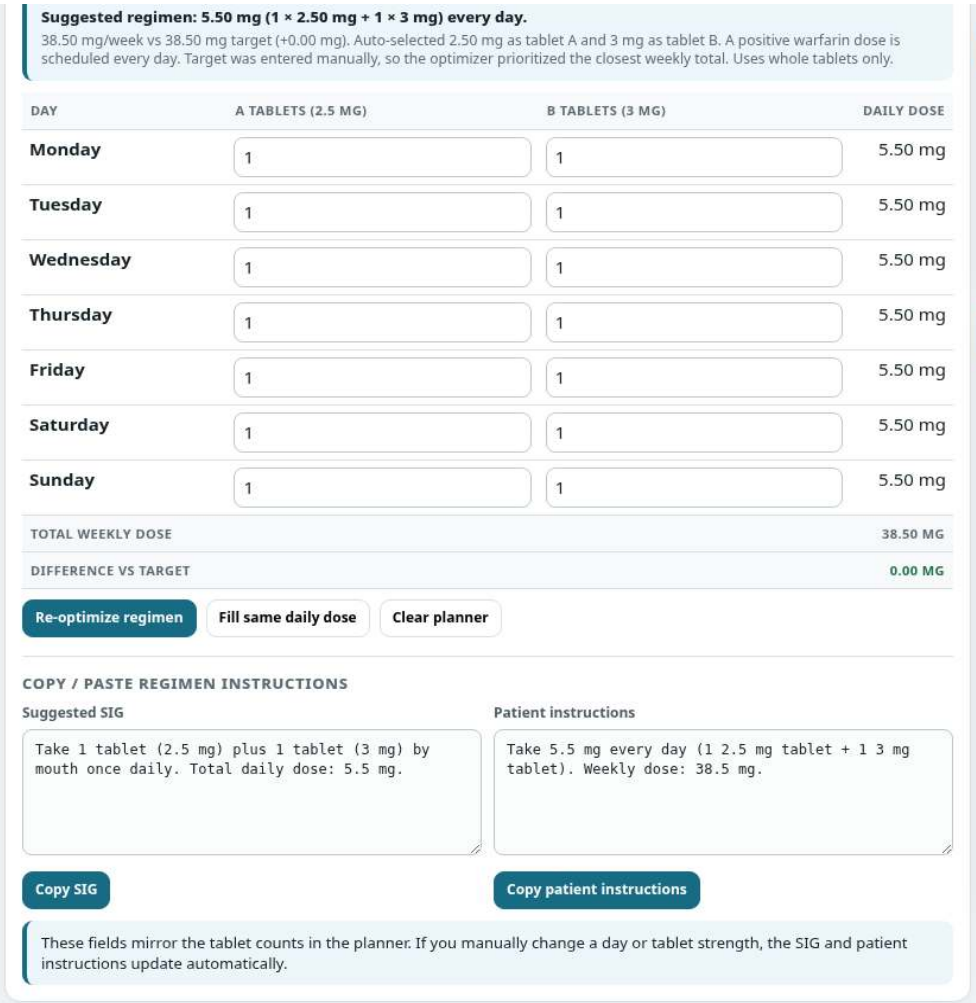
3 Check weekly total

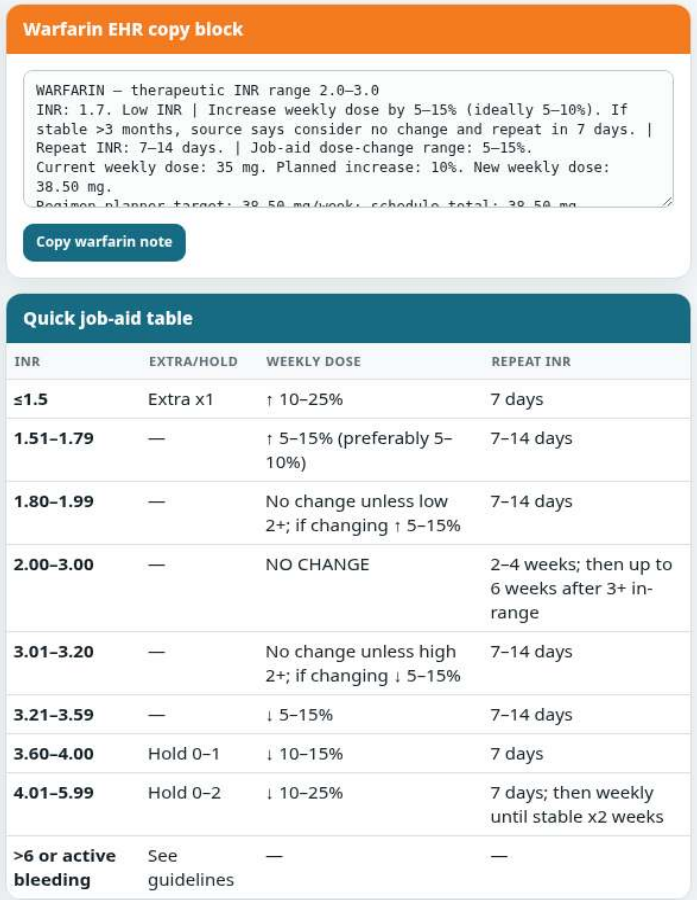
The table reports total weekly dose and difference vs target, so you can judge accuracy and practicality.

4 Patient-friendly may beat exact

The optimizer can favor a simpler schedule within acceptable range rather than a mathematically exact but confusing regimen.

SIG and patient instructions translate the table into usable language





Runs entirely in the browser. No network connection is required.

1 Suggested SIG

The generated SIG reflects the weekly schedule, tablet strengths, and dose pattern.

2 Patient instructions

The patient-friendly block restates the regimen in plain language.

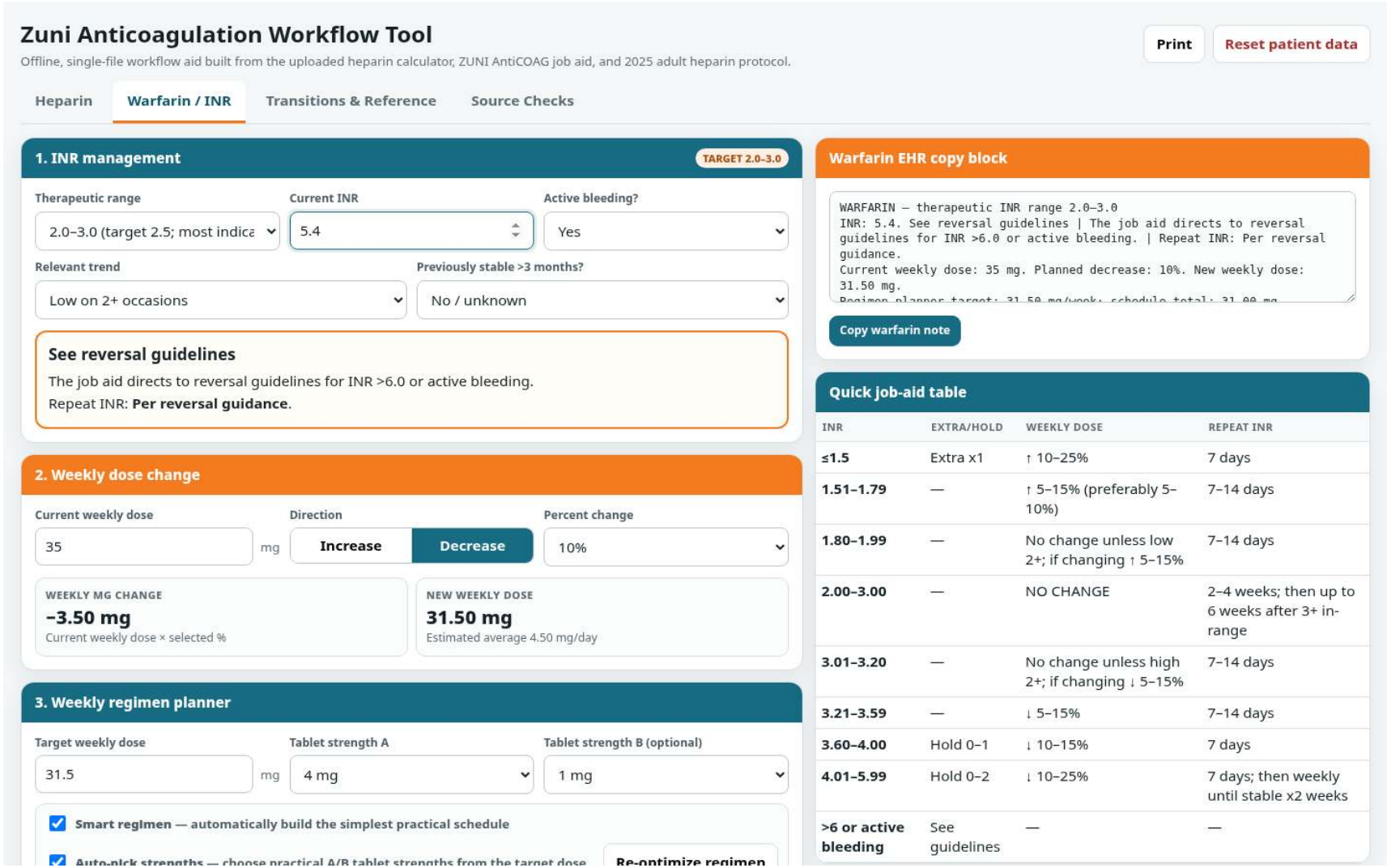
3 Copy blocks are editable inputs to care

They are meant for review and adaptation, not automatic signing.

4 Verify tablets on hand

Before dispensing or counseling, confirm actual available strength(s), label, and patient understanding.

High INR or active bleeding: route out of routine adjustment logic



Zuni Anticoagulation Workflow Tool

Offline, single-file workflow aid built from the uploaded heparin calculator, ZUNI AntiCOAG job aid, and 2025 adult heparin protocol.

Print | Reset patient data

Heparin | Warfarin / INR | Transitions & Reference | Source Checks

1. INR management — TARGET 2.0–3.0

Therapeutic range: 2.0–3.0 (target 2.5; most indica)
Current INR: 5.4
Active bleeding?: Yes
Relevant trend: Low on 2+ occasions
Previously stable >3 months?: No / unknown

See reversal guidelines
The job aid directs to reversal guidelines for INR >6.0 or active bleeding.
Repeat INR: **Per reversal guidance**.

2. Weekly dose change

Current weekly dose: 35 mg
Direction: Increase | Decrease
Percent change: 10%
WEEKLY MG CHANGE: −3.50 mg — Current weekly dose × selected %
NEW WEEKLY DOSE: 31.50 mg — Estimated average 4.50 mg/day

3. Weekly regimen planner

Target weekly dose: 31.5 mg
Tablet strength A: 4 mg
Tablet strength B (optional): 1 mg
Smart regimen — automatically build the simplest practical schedule
Auto-pick strengths — choose practical A/B tablet strengths from the target dose
Re-optimize regimen

Warfarin EHR copy block

```
WARFARIN — therapeutic INR range 2.0–3.0
INR: 5.4. See reversal guidelines | The job aid directs to reversal
guidelines for INR >6.0 or active bleeding. | Repeat INR: Per reversal
guidance.
Current weekly dose: 35 mg. Planned decrease: 10%. New weekly dose:
31.50 mg.
```

Copy warfarin note

Quick job-aid table

INR	EXTRA/HOLD	WEEKLY DOSE	REPEAT INR
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3.21–3.59	—	↓ 5–15%	7–14 days
3.60–4.00	Hold 0–1	↓ 10–15%	7 days
4.01–5.99	Hold 0–2	↓ 10–25%	7 days; then weekly until stable x2 weeks
>6 or active bleeding	See guidelines	—	—

1 — Active bleeding is a special case

Select Yes when bleeding is present; the tool directs the user away from routine weekly dose adjustment.

2 — Hold / vitamin K / reversal decisions

Use guideline-based management, bleeding severity, INR, indication, and local policy.

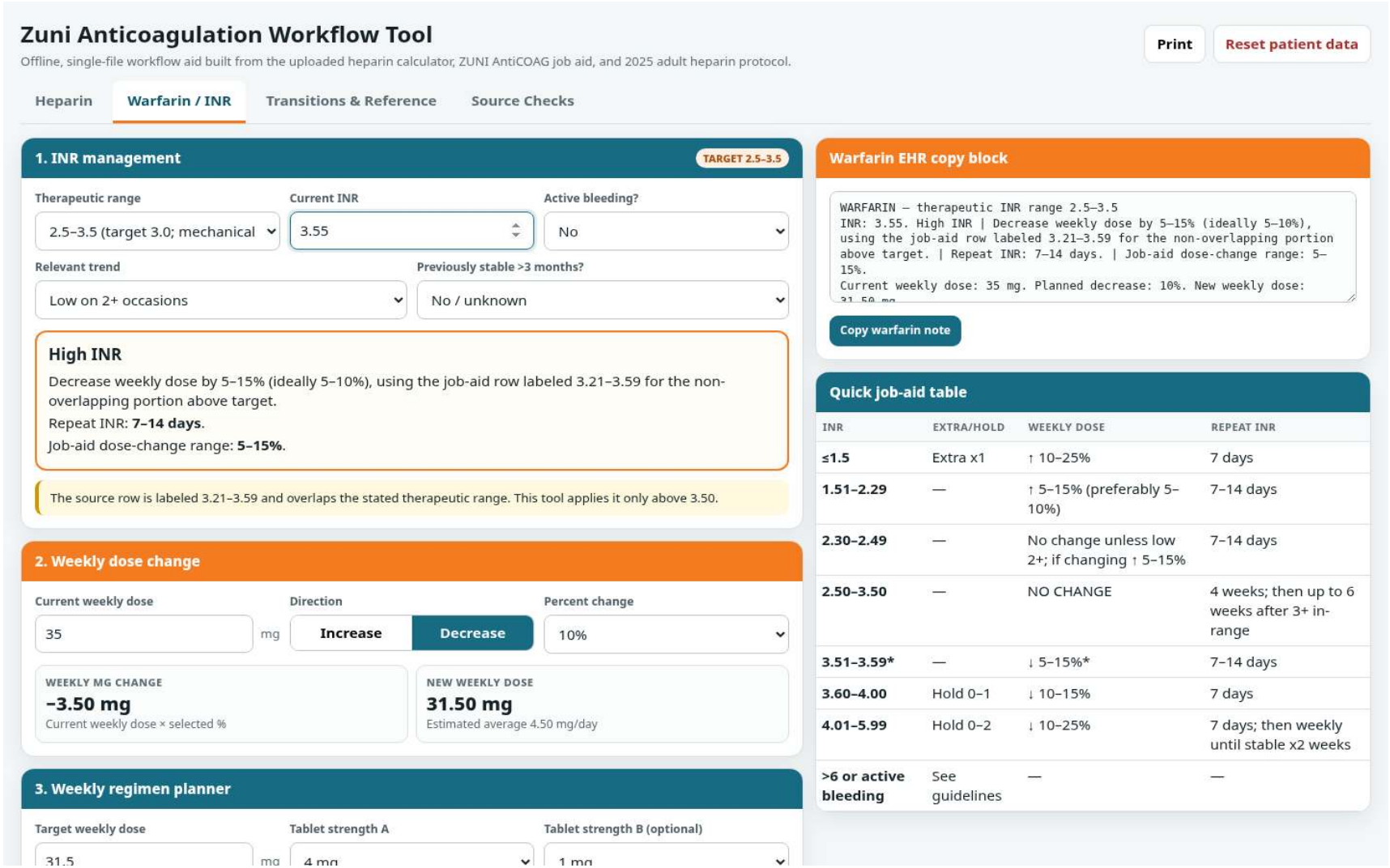
3 — Planner is not the priority

Do not generate a simple weekly-regimen change when the clinical problem is active bleeding.

4 — Document the escalation

The copy block should reflect that the scenario is no longer routine outpatient INR titration.

Warfarin 2.5–3.5 range: know the preserved source discrepancy



1 — Target range changes the table

The tool switches to the 2.5–3.5 job-aid logic when that range is selected.

2 — Overlap is not hidden

The source has rows that overlap the stated therapeutic range; the tool displays a warning and handles the overlap explicitly.

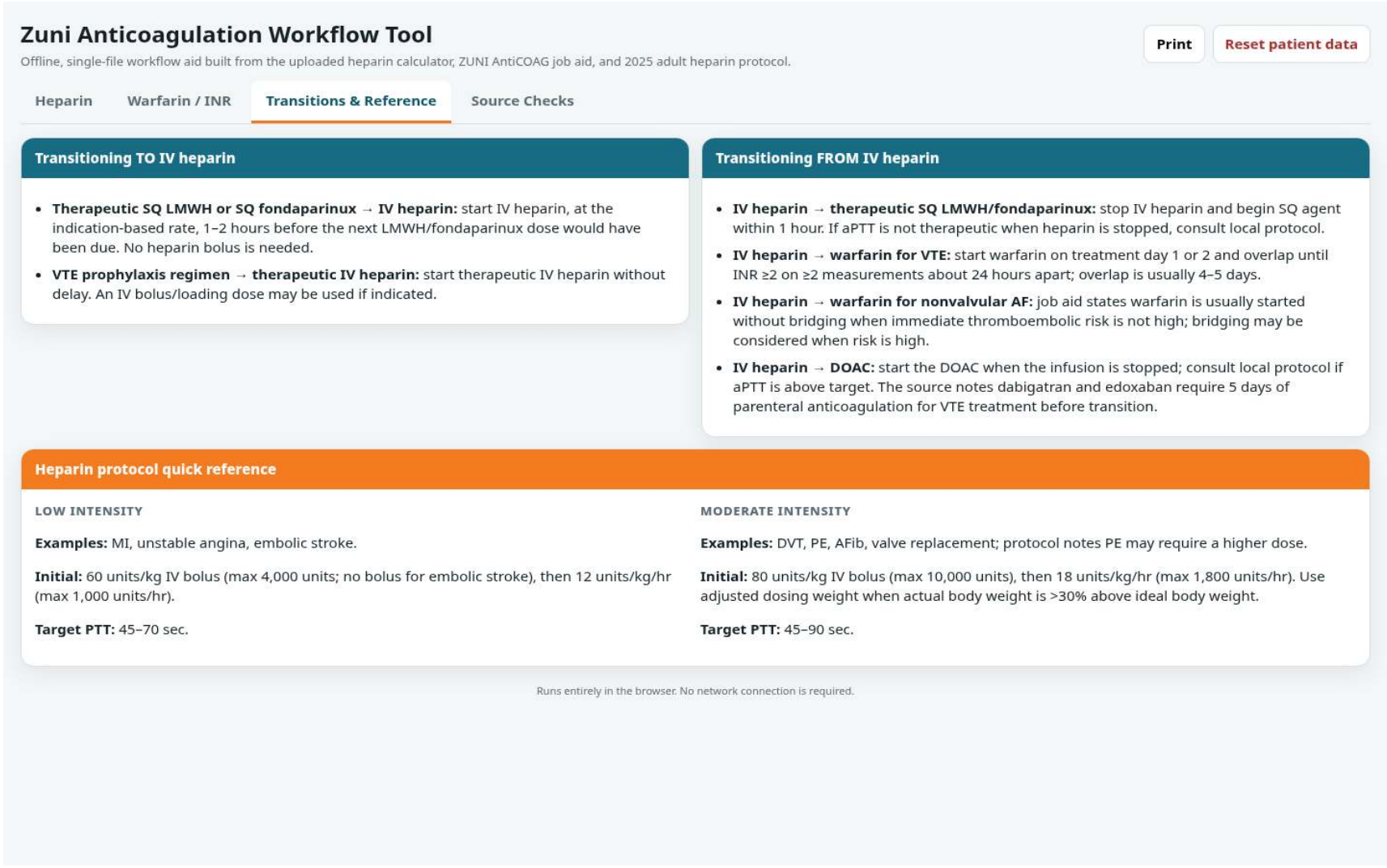
3 — Therapeutic range preserved

The tool treats the stated 2.5–3.5 therapeutic range as no-change through 3.50.

4 — Use Source Checks for audit

When a recommendation looks surprising, open Source Checks before assuming the calculator made an error.

Transitions & Reference: use for bridge timing and quick protocol lookup



1 — Transitioning to heparin

Reference list summarizes timing considerations when moving TO IV heparin.

2 — Transitioning from heparin

Separate list summarizes timing considerations when moving FROM IV heparin.

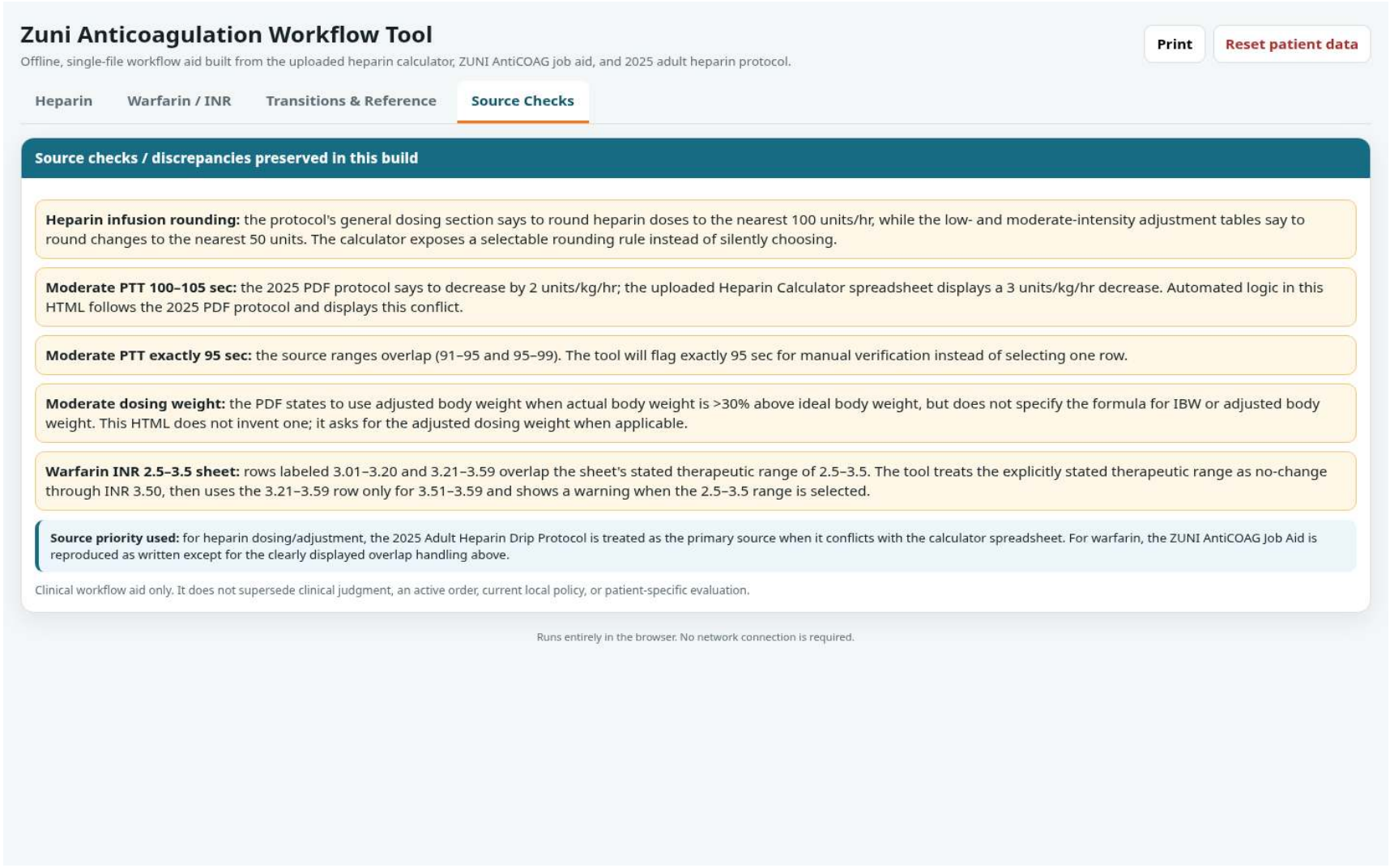
3 — Protocol quick reference

The tab preserves target ranges, bolus/rate logic, and adjustment-table cues without requiring a patient entry.

4 — Reference, not patient-specific

Use this tab for guidance and confirmation; use the Heparin tab for a patient-specific calculated plan.

Source Checks explains the deliberate discrepancies preserved in the build



1 — Heparin rounding discrepancy

General dosing and adjustment tables disagree; the tool exposes the rounding choice.

2 — Moderate PTT 100–105 sec

The tool follows the 2025 PDF protocol and displays the spreadsheet/PDF conflict.

3 — Warfarin overlap

The 2.5–3.5 INR-range overlap is preserved and explained.

4 — Source priority is explicit

The tab tells users which source was treated as primary when conflicts occurred.

Anticoagulation Workflow — Complete

1. **Heparin start**
   Protocol → weight → bolus/rate → mL/hr
2. **PTT adjustment**
   Current PTT + current rate → action
3. **Reversal / checklist**
   Protamine estimate + setup safeguards
4. **Warfarin INR**
   Target range + INR + bleeding/trend context
5. **Weekly regimen**
   Dose-change math → patient-friendly schedule
6. **References**
   Transitions + source-conflict checks

The safest use of the tool is to keep patient-specific calculations, protocol references, and source discrepancies visible rather than hidden.

Vancomycin PK / AUC

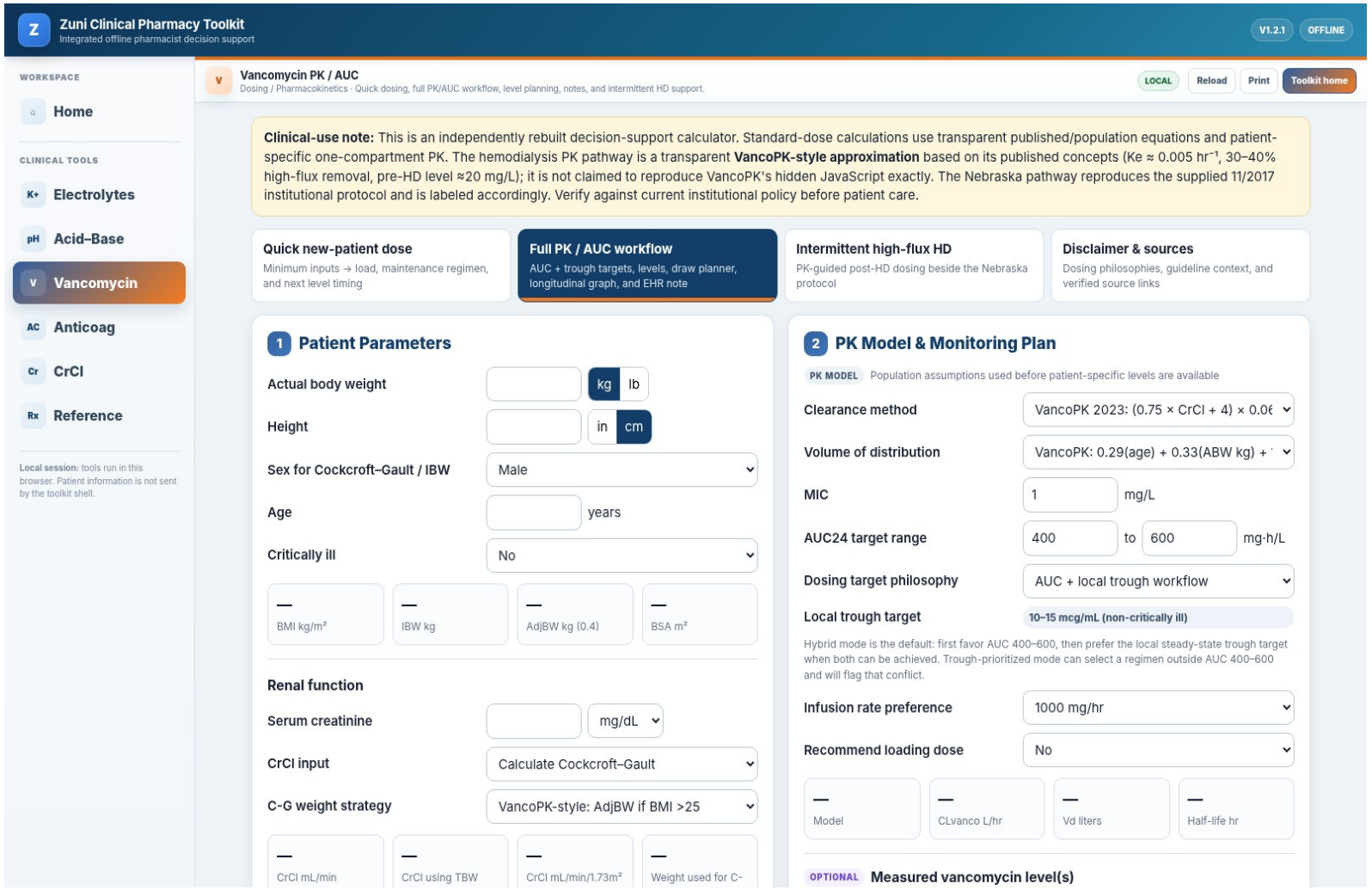
Chapter 1 — Orientation + Quick New-Patient Dose

A careful walkthrough of the fast starting-dose workflow before moving into the full PK/AUC engine.

Training case: fictitious 62-year-old male • 92 kg • 178 cm • SCr 1.10 mg/dL • critically ill

Instruction → actual interaction → rendered result

Choose the workflow before entering data



1 — Quick new-patient dose

Minimum inputs for a fast starting load, maintenance regimen, and first-level plan.

2 — Full PK / AUC workflow

Use when timing is complex, levels are available, or you need patient-specific PK and regimen changes.

3 — Intermittent high-flux HD

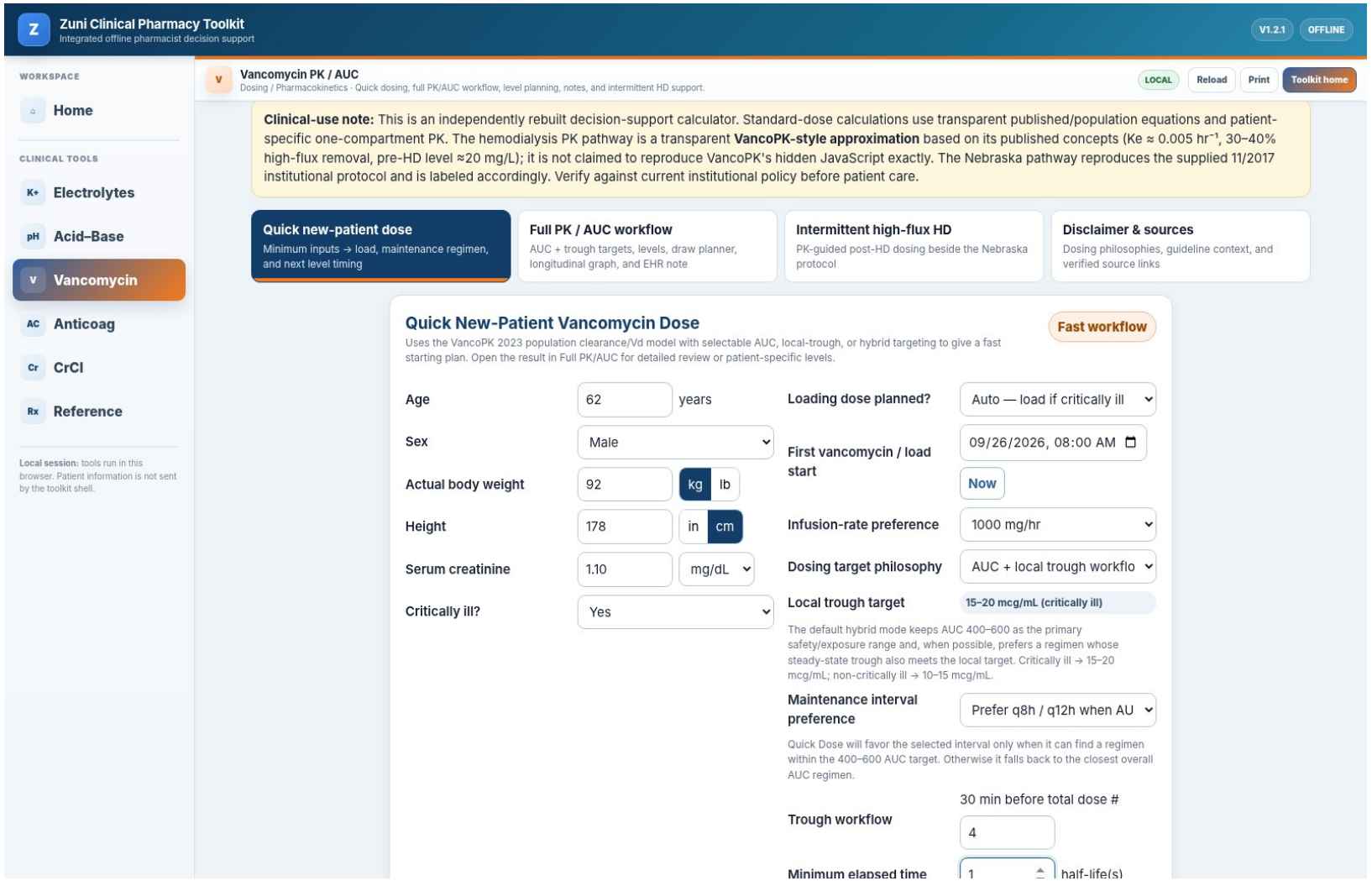
Separate workflow for stable intermittent high-flux hemodialysis.

4 — Disclaimer & sources

Explains targeting philosophies, limitations, and source material.

Chapter 1 focuses only on Quick Dose. Later chapters will teach the detailed PK/AUC and HD workflows.

Quick Dose: enter the minimum patient information



1 — Patient factors

Age, sex, actual weight, height, SCr, and critical-illness status drive the population estimate.

2 — Loading-dose decision

Auto uses the critical-illness flag. You can explicitly override to Yes or No.

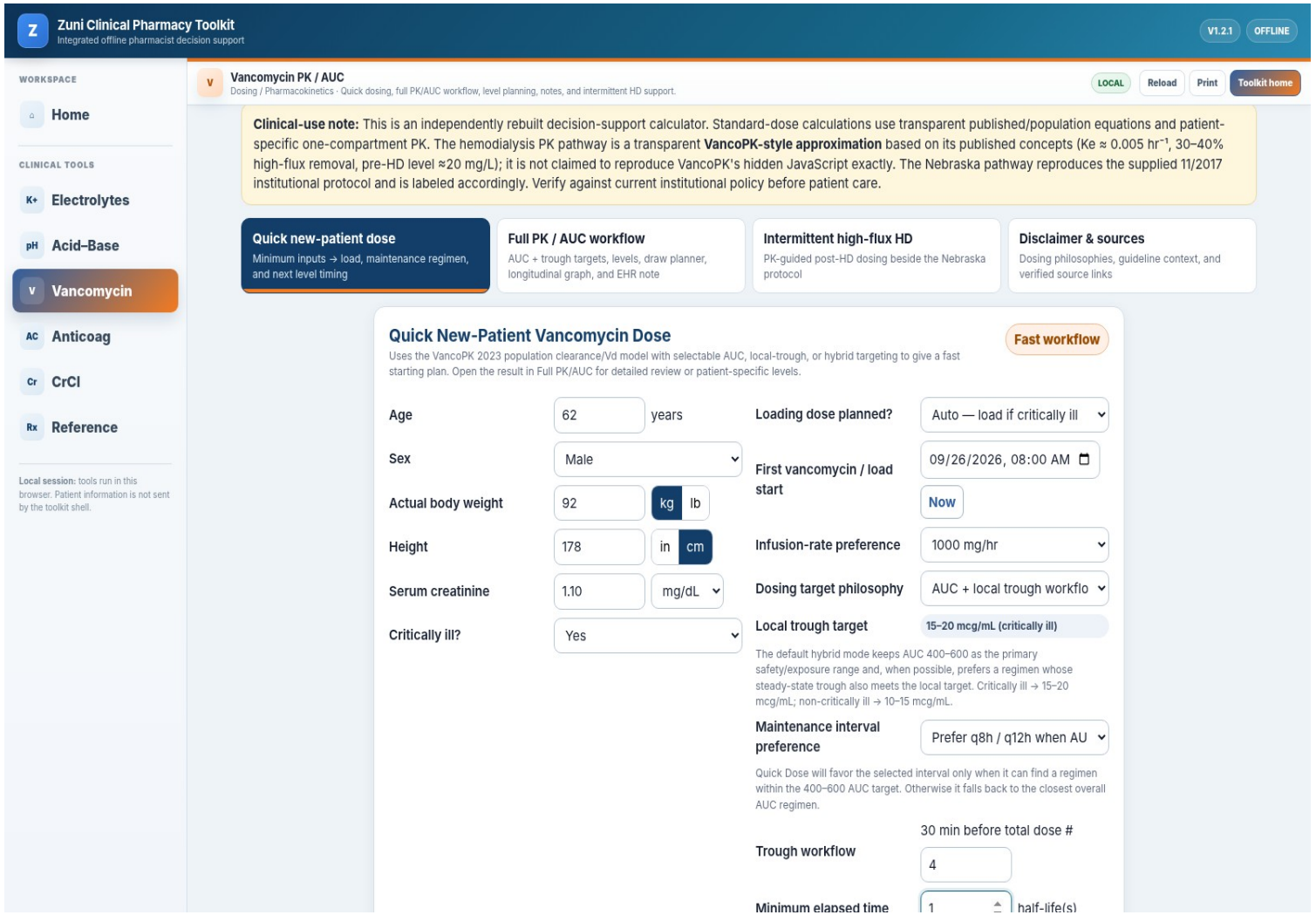
3 — Start time matters

The first vancomycin/load start is used to turn the monitoring rule into a real clock time.

4 — Infusion preference

Choose 1000, 750, or 500 mg/hr; the regimen and timing outputs use that selection.

Quick Dose: define how the starting regimen is ranked



1

Default: AUC + local trough

The tool keeps AUC 400–600 as the primary exposure range and, when possible, also meets the local trough target.

2

Critical illness changes the local target

In this workflow, non-critical = 10–15 mcg/mL; critically ill = 15–20 mcg/mL.

3

Interval preference is conditional

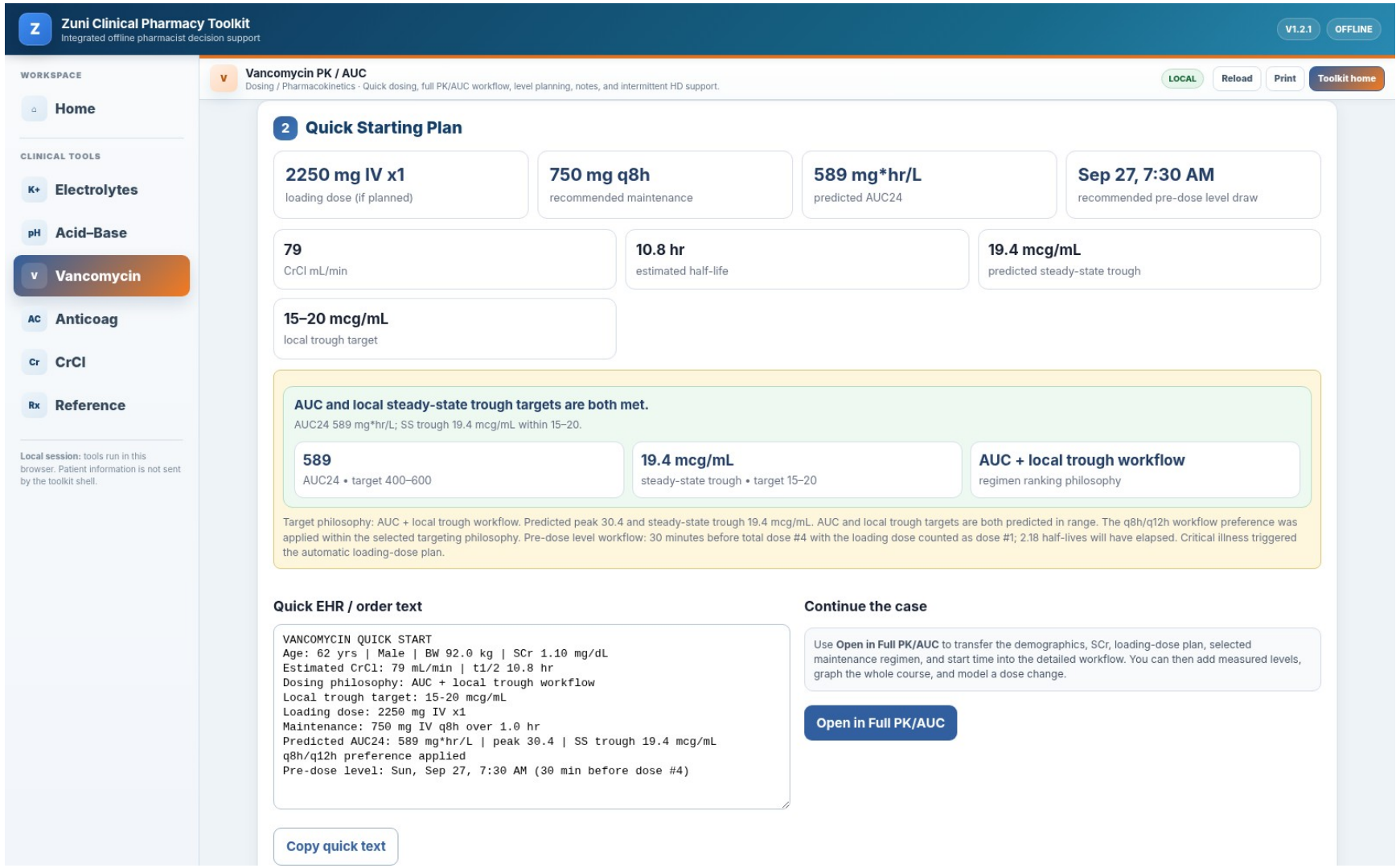
q8h/q12h is preferred only when a candidate satisfies the selected target logic; otherwise the search falls back.

4

Monitoring rule

Default: draw 30 minutes before total dose #4, after at least 1 estimated half-life.

Quick Dose: read the starting plan as a connected recommendation



1 Load

2250 mg IV x1 was selected because the fictitious patient is marked critically ill.

2 Maintenance

750 mg q8h is the recommended starting maintenance regimen.

3 Exposure

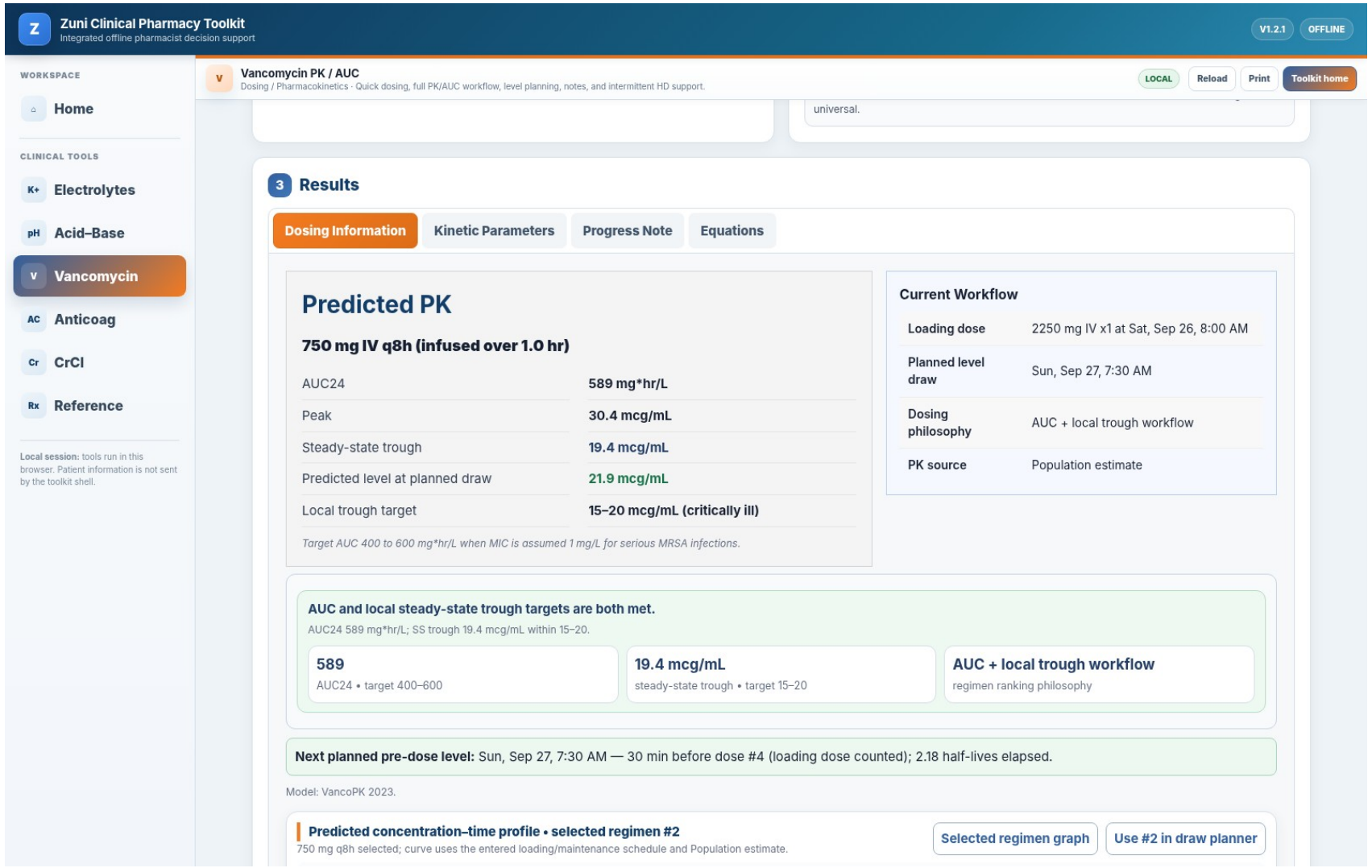
Predicted AUC24 = 589 mg*hr/L and steady-state trough = 19.4 mcg/mL.

4 First level

The rule resolves to Sep 27 at 7:30 AM - 30 minutes before total dose #4.

Do not read any one number in isolation. The green assessment panel explains whether the AUC and local trough goals agree.

Quick Dose is the starting point — continue complex cases in Full PK/AUC



1 — Transfer, don't retype

Open in Full PK/AUC carries forward demographics, SCr, loading-dose plan, maintenance regimen, and timing.

2 — Why continue?

Use the detailed workflow when actual administration times differ, measured levels become available, or the regimen needs adjustment.

3 — What comes next

Chapter 2 will start here and teach population PK, regimen selection, AUC/trough interpretation, and the detailed monitoring plan.

4 — Clinical boundary

Quick Dose is decision support. Verify patient-specific factors, current policy, indication, renal trajectory, and actual administration history.

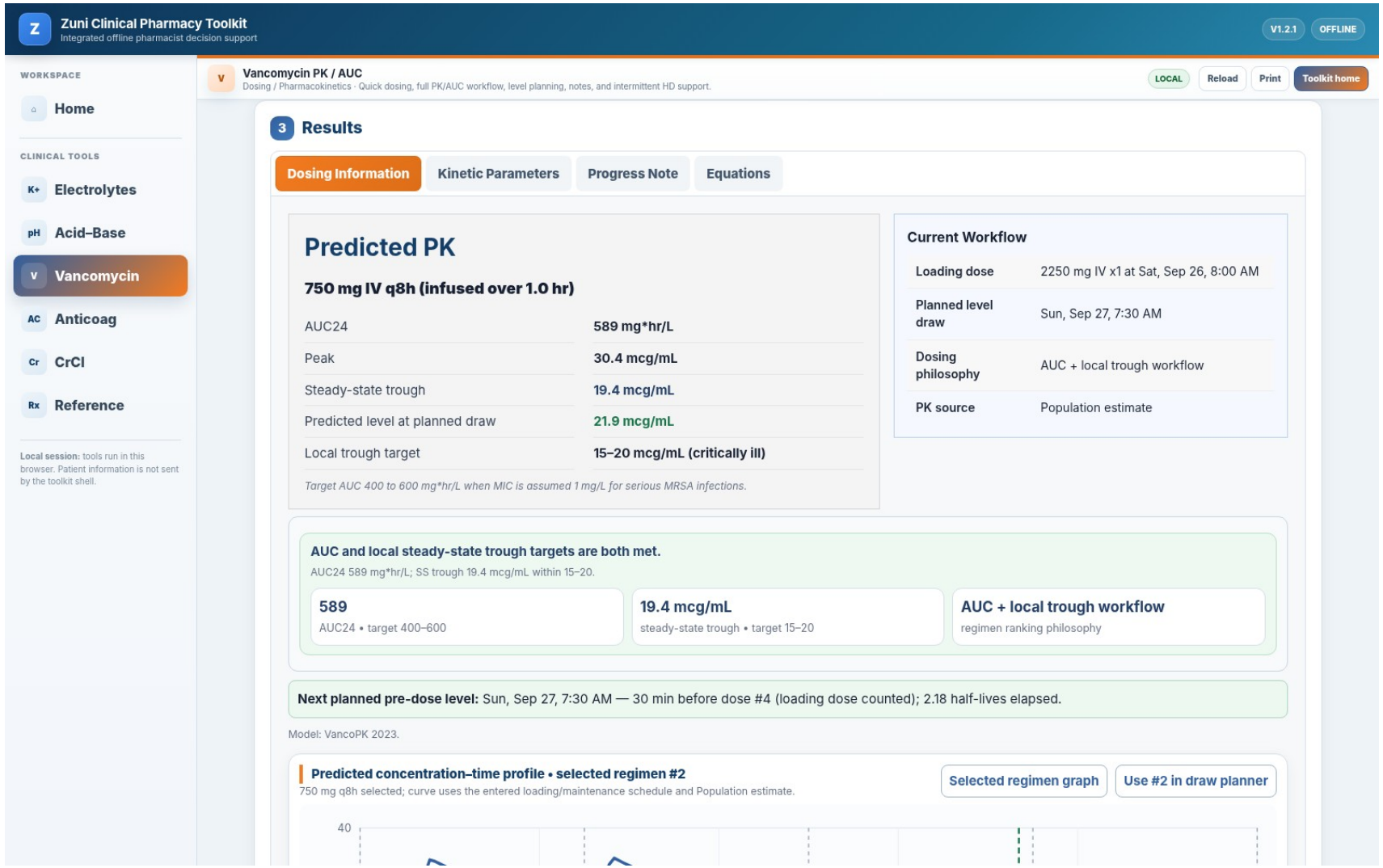
Vancomycin PK / AUC

Chapter 2 — Full PK/AUC: Initial Dosing

Continue the Chapter 1 patient from the quick starting plan into the detailed PK/AUC workflow.

Training case: fictitious 62-year-old male • 92 kg • 178 cm • SCr 1.10 mg/dL • critically ill

Continue the Quick Dose case in Full PK/AUC



1 Confirm the transfer

The patient demographics, SCr, loading-dose plan, maintenance regimen, and start time carry forward.

2 Review before calculating

Check that the transferred information matches the actual plan before using the detailed workflow.

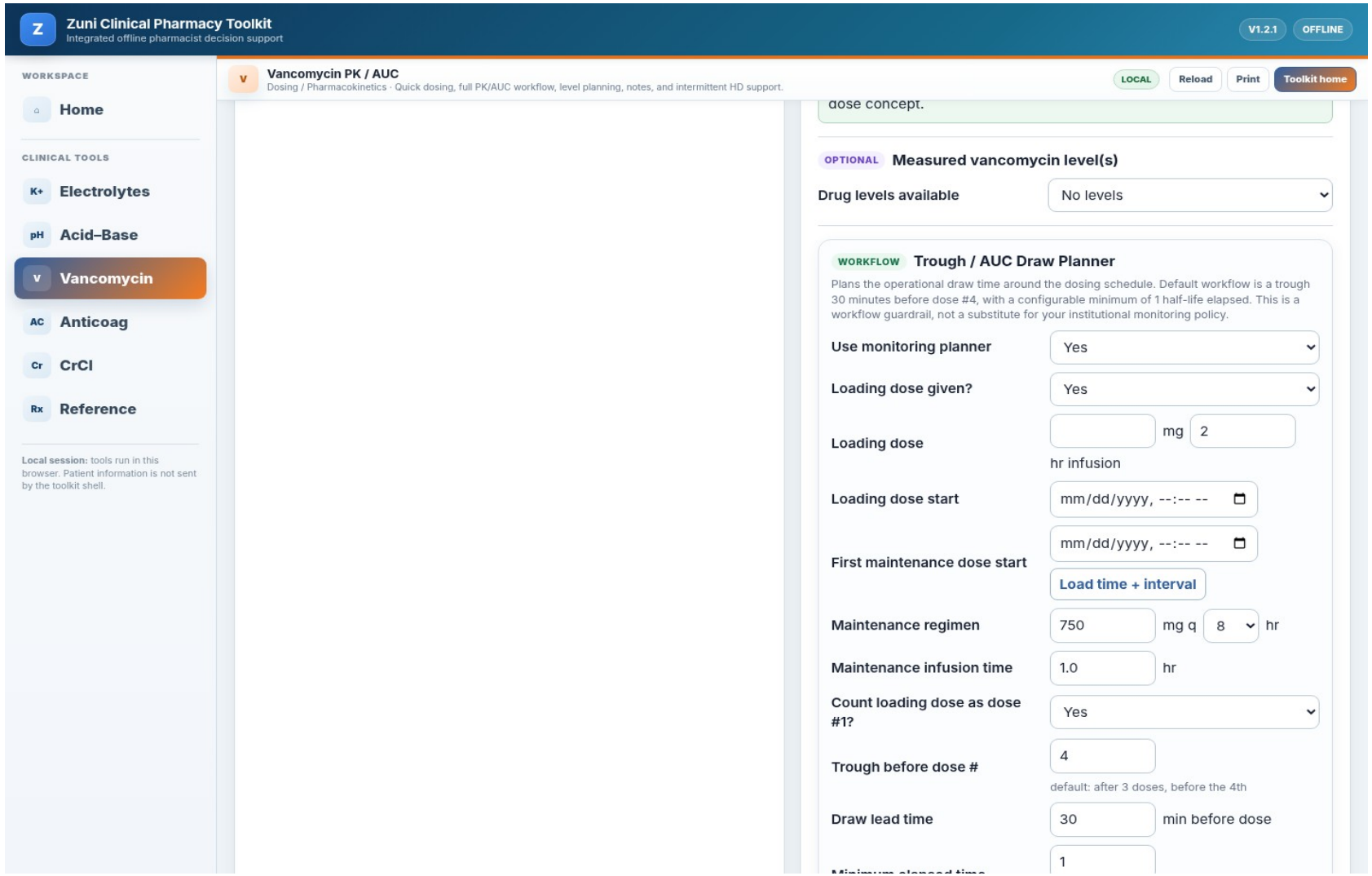
3 No measured levels yet

At this point, the calculator is still using population PK to predict the patient's exposure.

4 Why use Full PK/AUC?

This view adds detailed regimen comparison, dose-history planning, levels, graphs, and follow-up tools.

Verify the patient and renal inputs



1 Review body-size calculations

The tool displays TBW, IBW, AdjBW, BMI, and BSA so the weight assumptions are visible.

2 Confirm CrCl

For this case, the calculator uses adjusted body weight and estimates CrCl at about 80 mL/min.

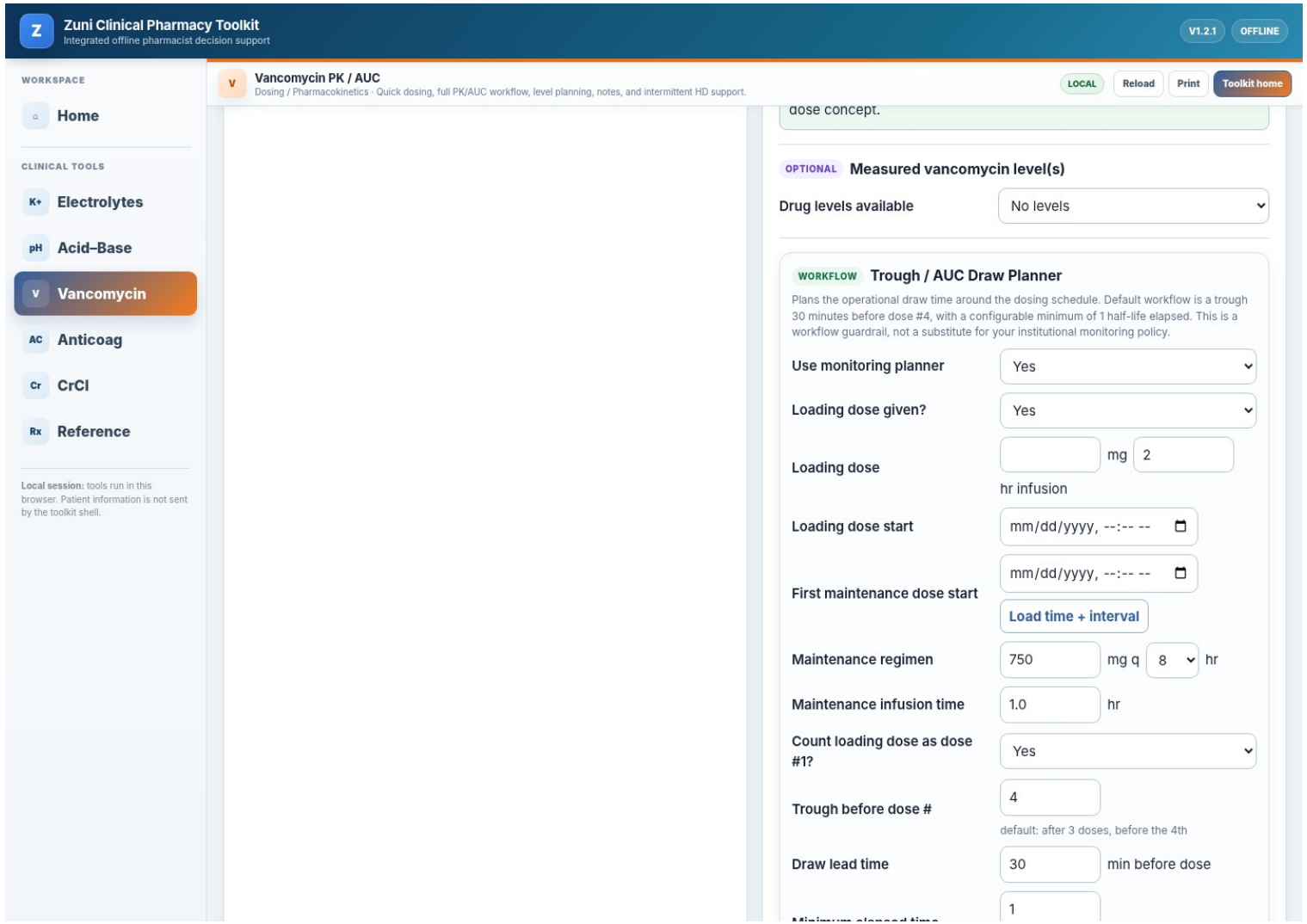
3 Review the PK model

The default VancoPK 2023 population model estimates clearance, Vd, elimination rate, and half-life.

4 Clinical check

If renal function is changing rapidly, the population estimate may become less reliable and should be interpreted cautiously.

Choose the exposure target before comparing regimens



1 AUC target

The default target is AUC24 400–600 mg·h/L with MIC entered separately.

2 Hybrid workflow

The default AUC + local trough option first favors AUC target attainment, then prefers the local trough range when possible.

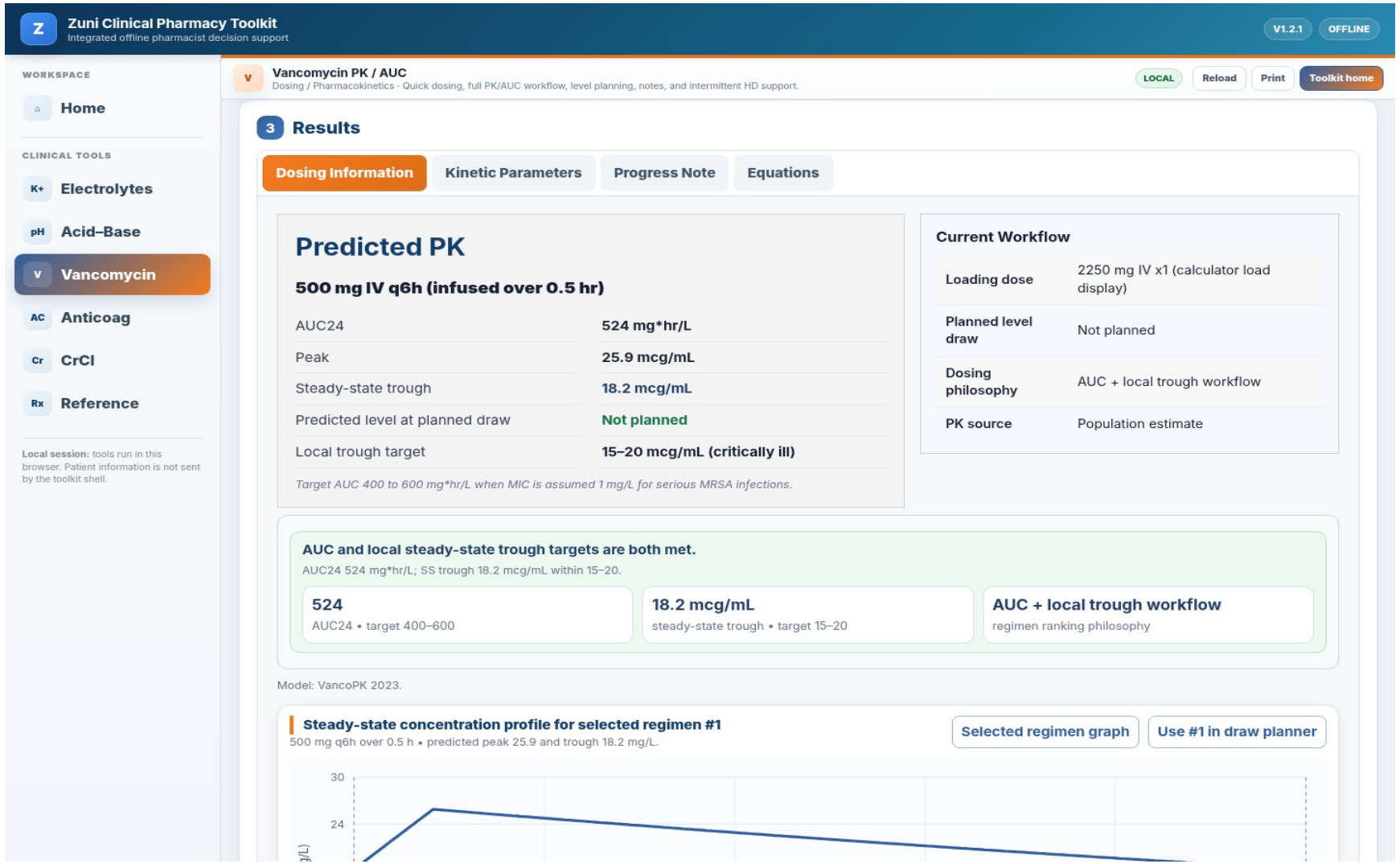
3 Infusion rate

Select the intended infusion rate because infusion duration affects predicted peak concentrations and timing.

4 Loading dose

For this critically ill training case, the transferred plan includes a 2250 mg loading dose.

Calculate the initial maintenance regimen



1 Selected regimen

The starting maintenance regimen is 750 mg IV every 8 hours.

2 Predicted exposure

The model predicts AUC24 about 589 mg·h/L for this maintenance regimen.

3 Peak and SS trough

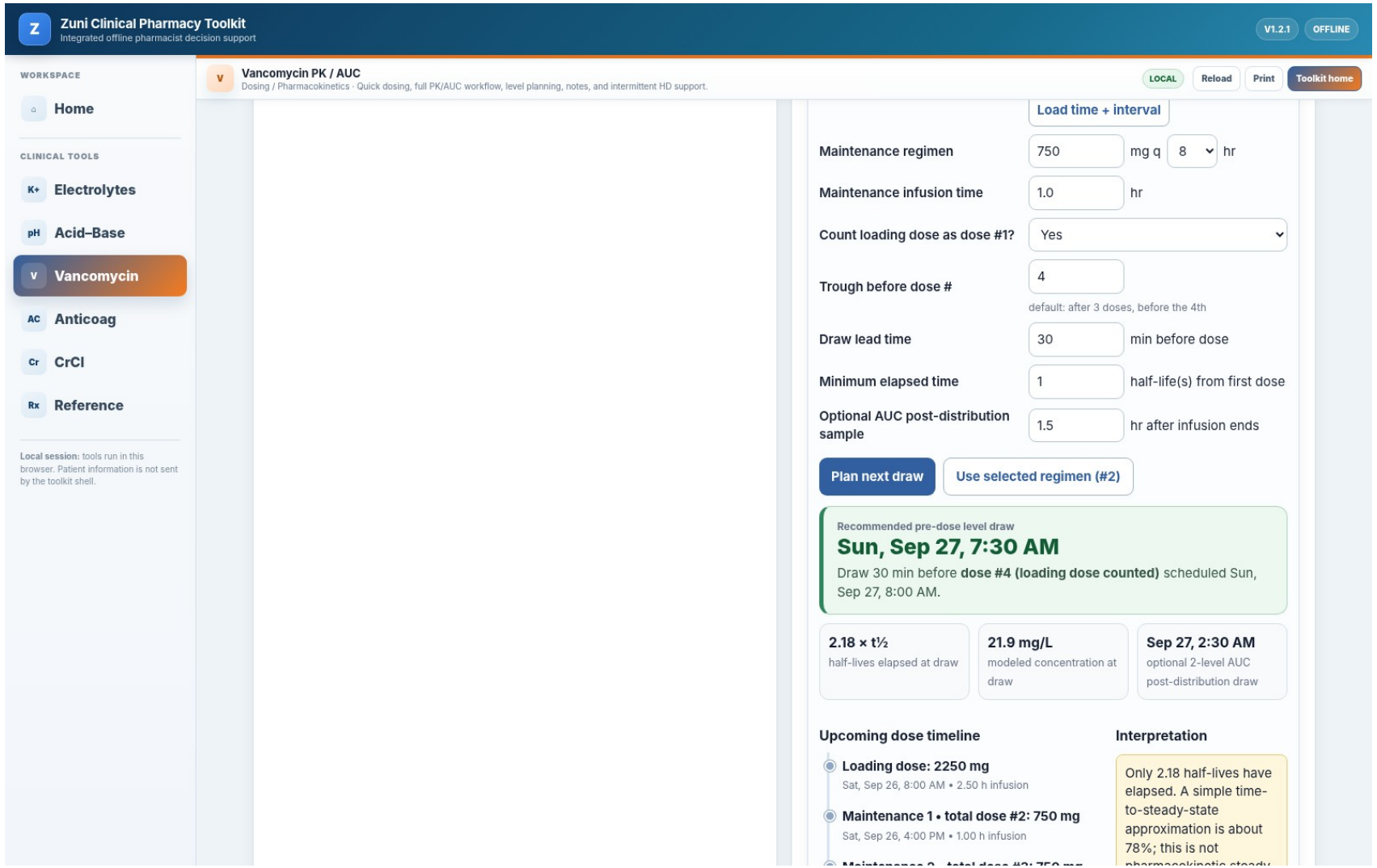
These are predicted steady-state maintenance-regimen metrics — not measured concentrations and not the loading-dose peak.

4 Next step

Populate the draw planner so the calculator can model the concentration at the actual early level time.

The steady-state trough and the concentration expected at an early planned draw are not necessarily the same.

Plan the first level using the complete dose history



1 **Enter the loading dose**

2250 mg starts Sep 26 at 08:00 and infuses over 2.5 hours.

2 **Enter maintenance dosing**

750 mg q8h begins at 16:00. This prevents the planned level from being modeled from the loading dose alone.

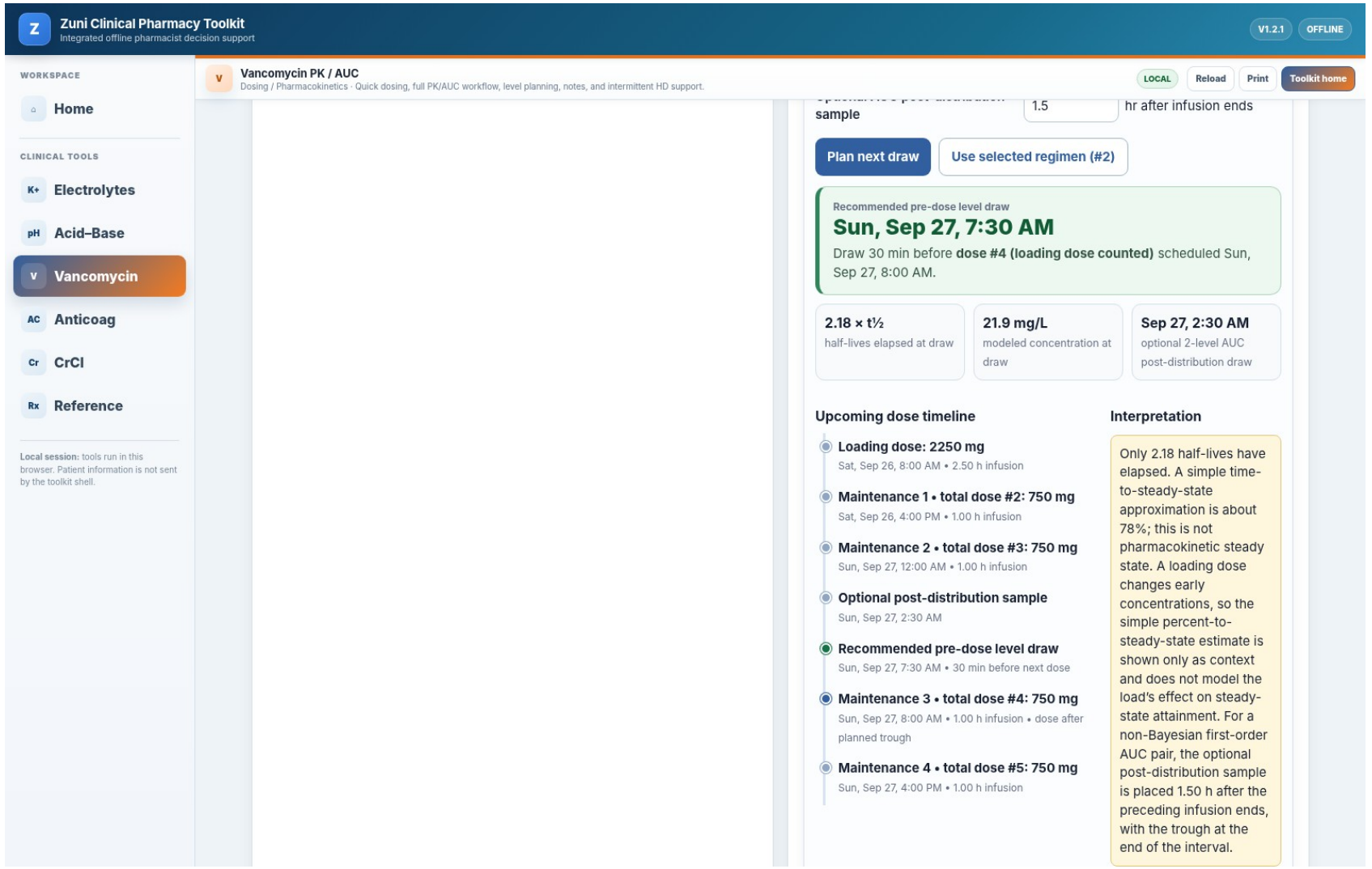
3 **Set the draw rule**

Count the load as dose #1 and plan the trough 30 minutes before total dose #4.

4 **Select Plan next draw**

The calculator builds the timeline and predicts the concentration at that exact draw time.

Interpret the planned level in the context of the actual course



1 — Follow the timeline

The planner shows the 2250 mg load followed by the scheduled 750 mg maintenance doses.

2 — Recommended draw

The first planned pre-dose level is Sep 27 at 07:30 — 30 minutes before total dose #4.

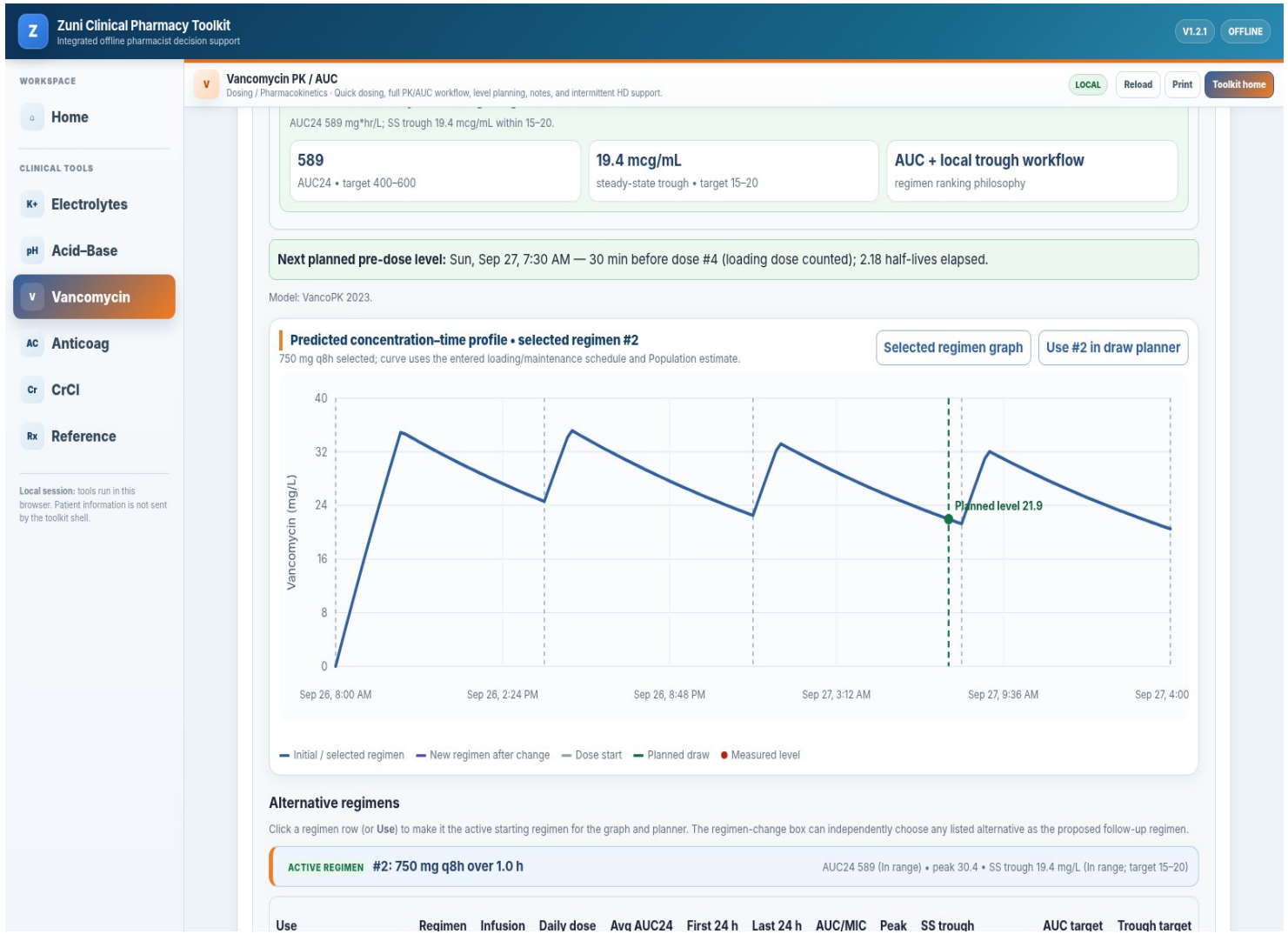
3 — Predicted at that draw

The model predicts about 21.9 mg/L using the residual drug from the load plus both maintenance doses.

4 — Early ≠ steady state

Only about 2.18 half-lives have elapsed, so the tool flags that this draw is not at pharmacokinetic steady state.

Know what each concentration on Dosing Information means



1

Peak: 30.4 mcg/mL

Predicted steady-state peak for repeated 750 mg q8h maintenance dosing after the infusion.

2

SS trough: 19.4 mcg/mL

Predicted steady-state trough for the maintenance regimen after accumulation.

3

Planned draw: 21.9 mcg/mL

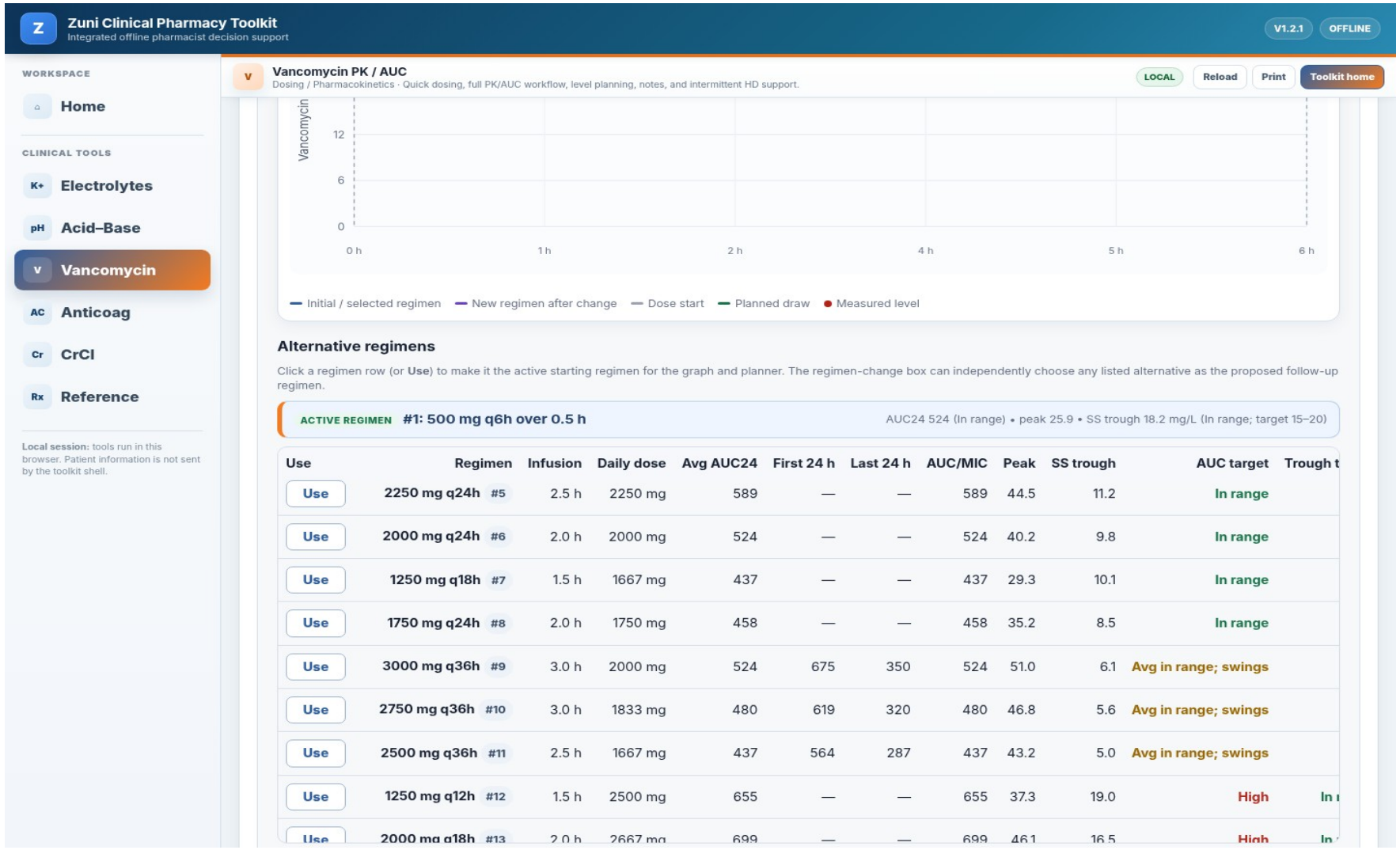
Predicted concentration at the actual early draw time using the entered loading + maintenance history.

4

Measured level

No measured level has been entered yet. Chapter 3 begins when an actual concentration returns.

Compare alternative maintenance regimens



1 Compare the rows

Each candidate shows dose, interval, daily dose, AUC, predicted peak, and steady-state trough.

2 Check both targets

AUC and local trough status are displayed separately so target conflicts remain visible.

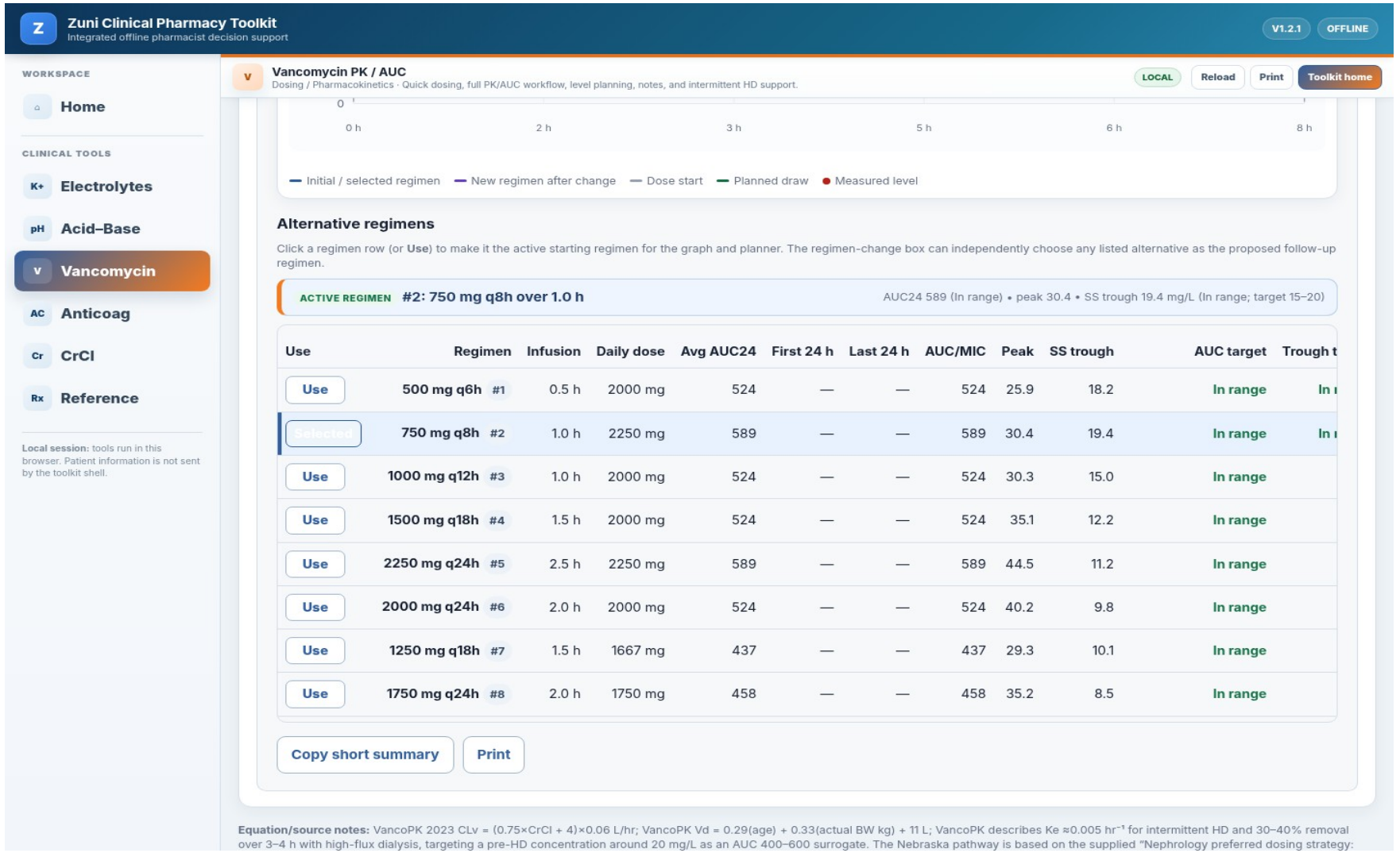
3 Use a different regimen

Select Use only when you want that candidate to become the active regimen for modeling.

4 Then re-plan the level

If the regimen changes, update the draw planner so the future timeline reflects the selected regimen.

The active regimen drives the graph and monitoring plan



1 — Confirm the selected row

The highlighted row and active-regimen banner show which regimen is being modeled.

2 — Recalculate downstream timing

Use the selected regimen in the draw planner rather than assuming the previous schedule still applies.

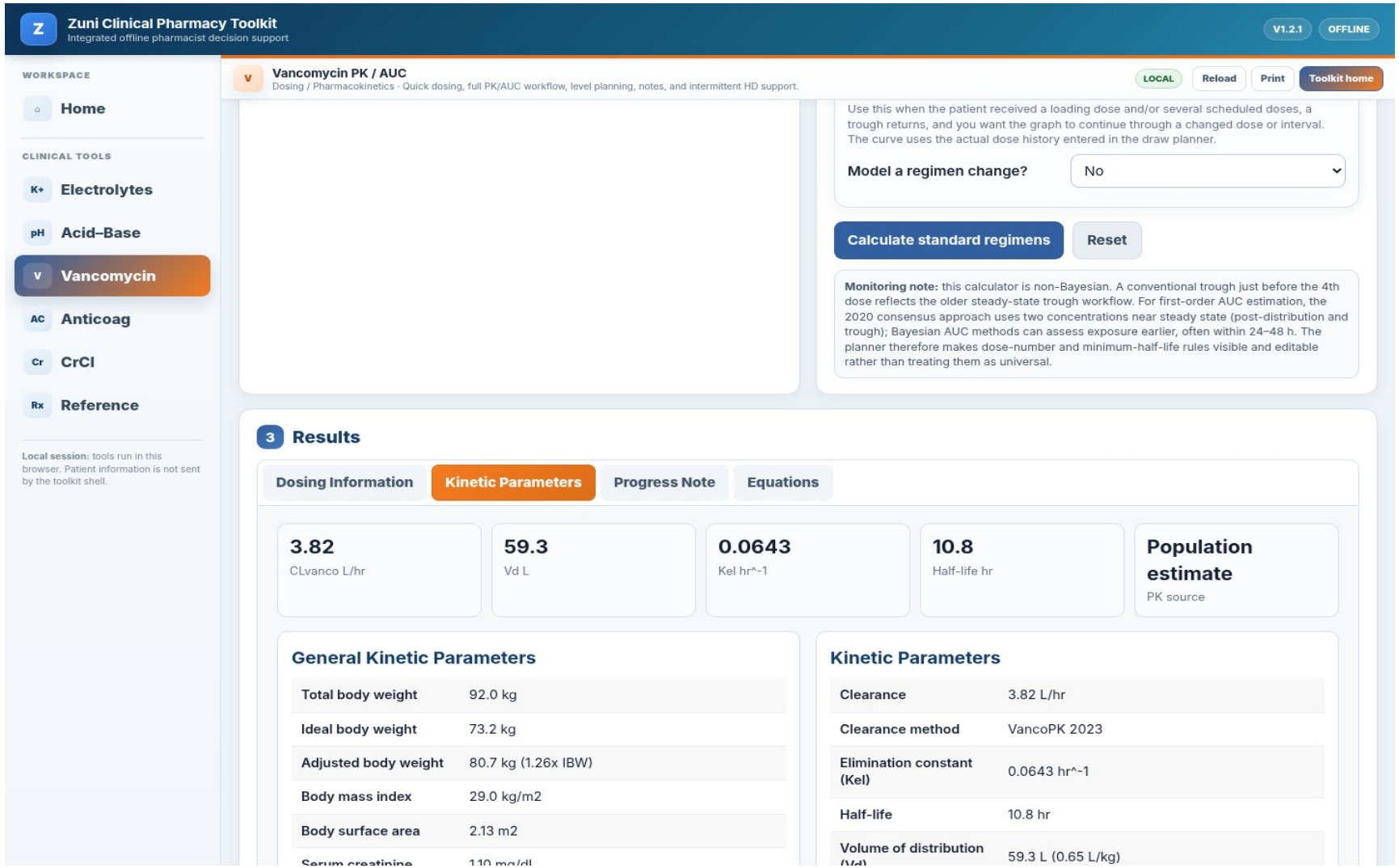
3 — Selection is decision support

The calculator compares exposure; it does not replace assessment of indication, renal trend, toxicity risk, or clinical

4 — Keep the actual history accurate

Do not rewrite doses the patient already received when modeling a future regimen.

Use Kinetic Parameters to verify the model behind the recommendation



1 Core PK

Review CLvanco, Vd, Ke, and half-life.

2 Patient calculations

Confirm the body weights, SCr, CrCl, and Cockcroft–Gault weight used.

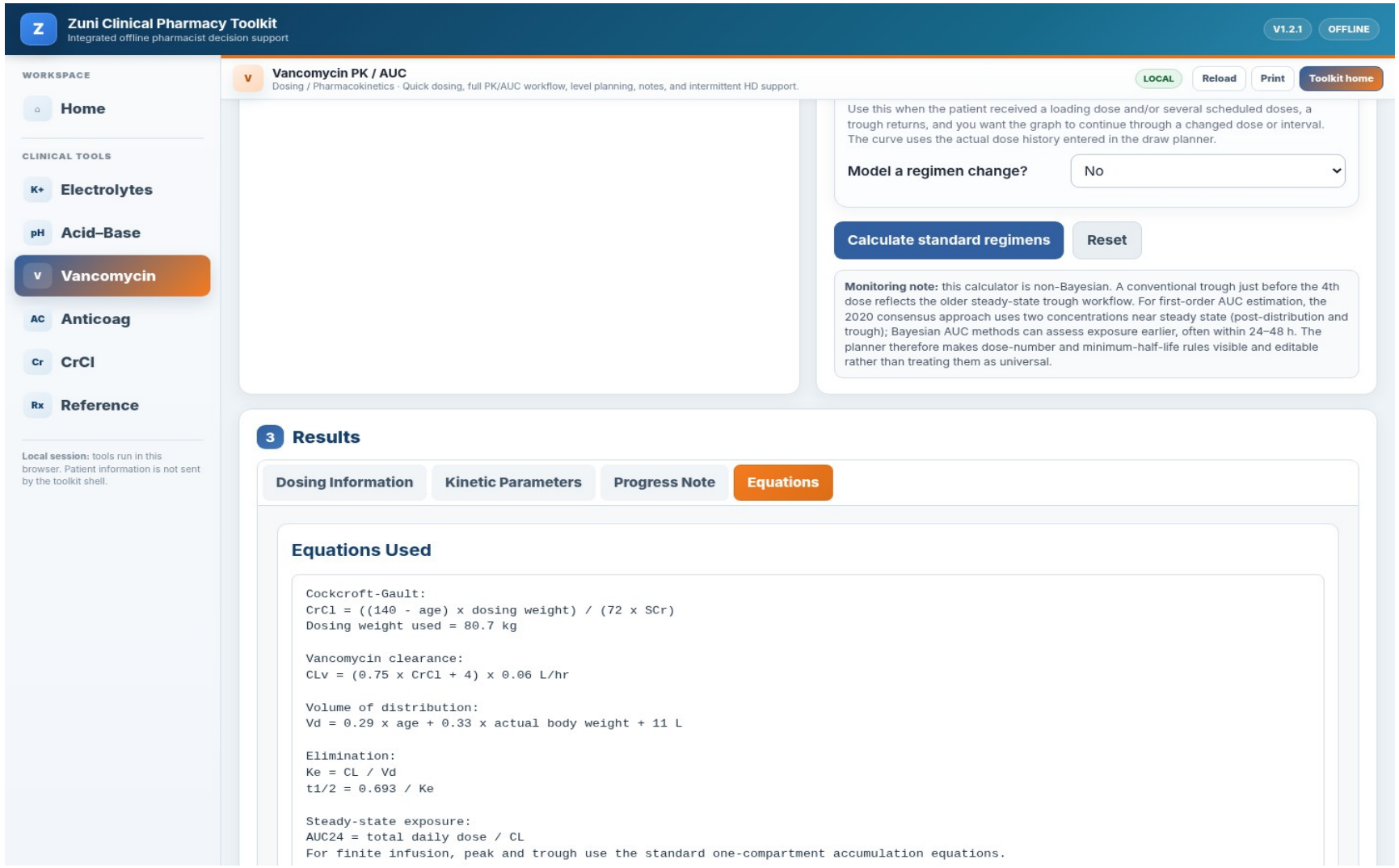
3 PK source

It should still read as a population estimate because no measured levels have been fitted yet.

4 Investigate surprises

Unexpected clearance or half-life should trigger a review of the inputs before acting on the regimen.

Use Equations when you need to audit how the result was generated



1 Renal equation

The Cockcroft–Gault calculation and dosing weight are visible.

2 Population equations

The selected clearance and volume equations are shown for transparency.

3 Regimen equations

The maintenance exposure calculations used for AUC, peak, and trough are documented.

4 Next: actual levels

Chapter 3 adds measured concentration(s) and teaches patient-specific PK and monitoring.

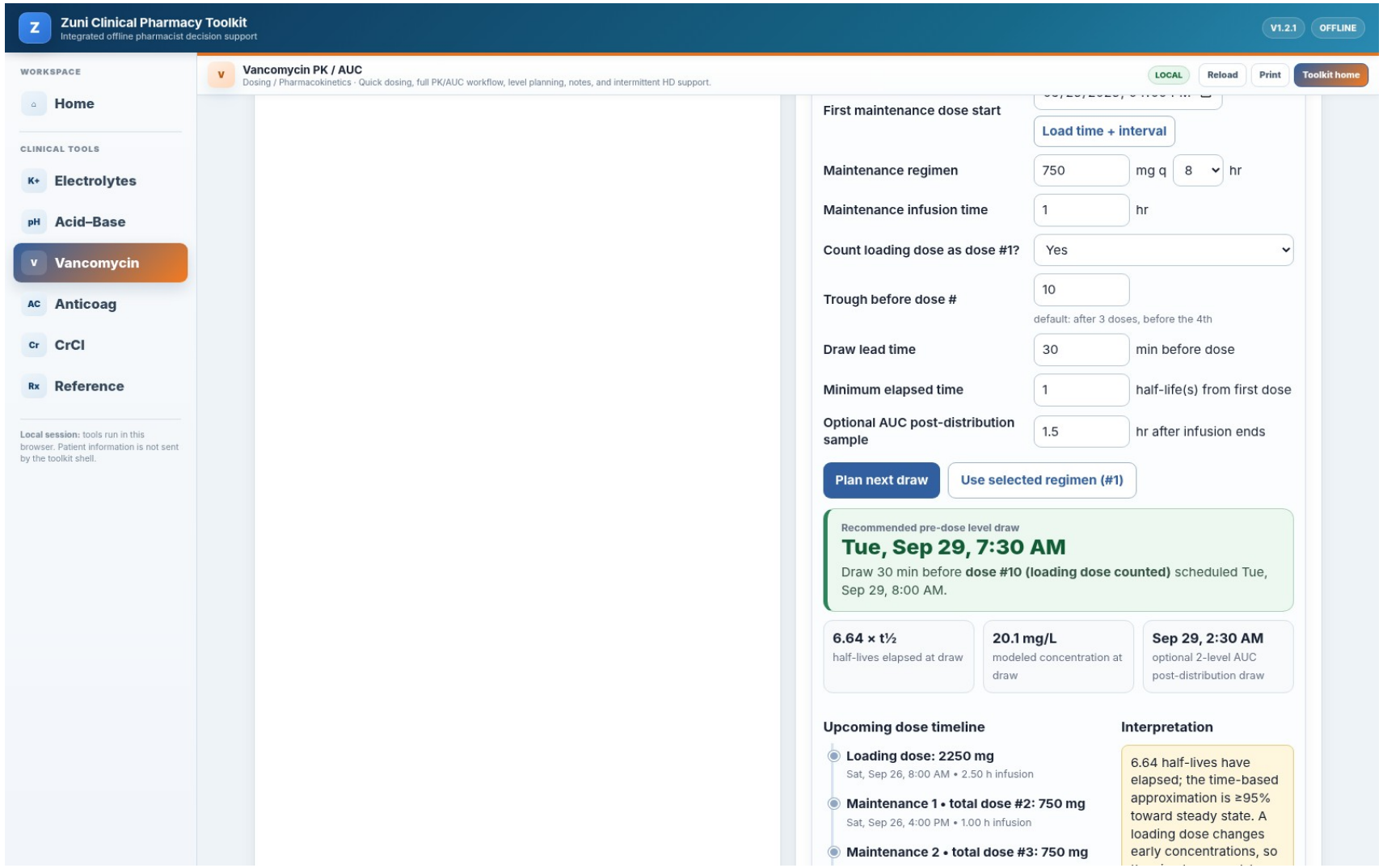
Vancomycin PK / AUC

Chapter 3 — Levels, Monitoring & Patient-Specific PK

Move from a population prediction to measured concentrations while keeping dose and sample timing explicit.

Same fictitious patient • continued 750 mg q8h course • measured levels introduced in this chapter

Advance the patient far enough to interpret measured levels



1 — Continue the actual schedule

The patient remains on 750 mg q8h after the loading dose. Keep the real administration history accurate.

2 — Later draw

The planner is moved later in the course so several maintenance doses have been given and >4 half-lives have elapsed.

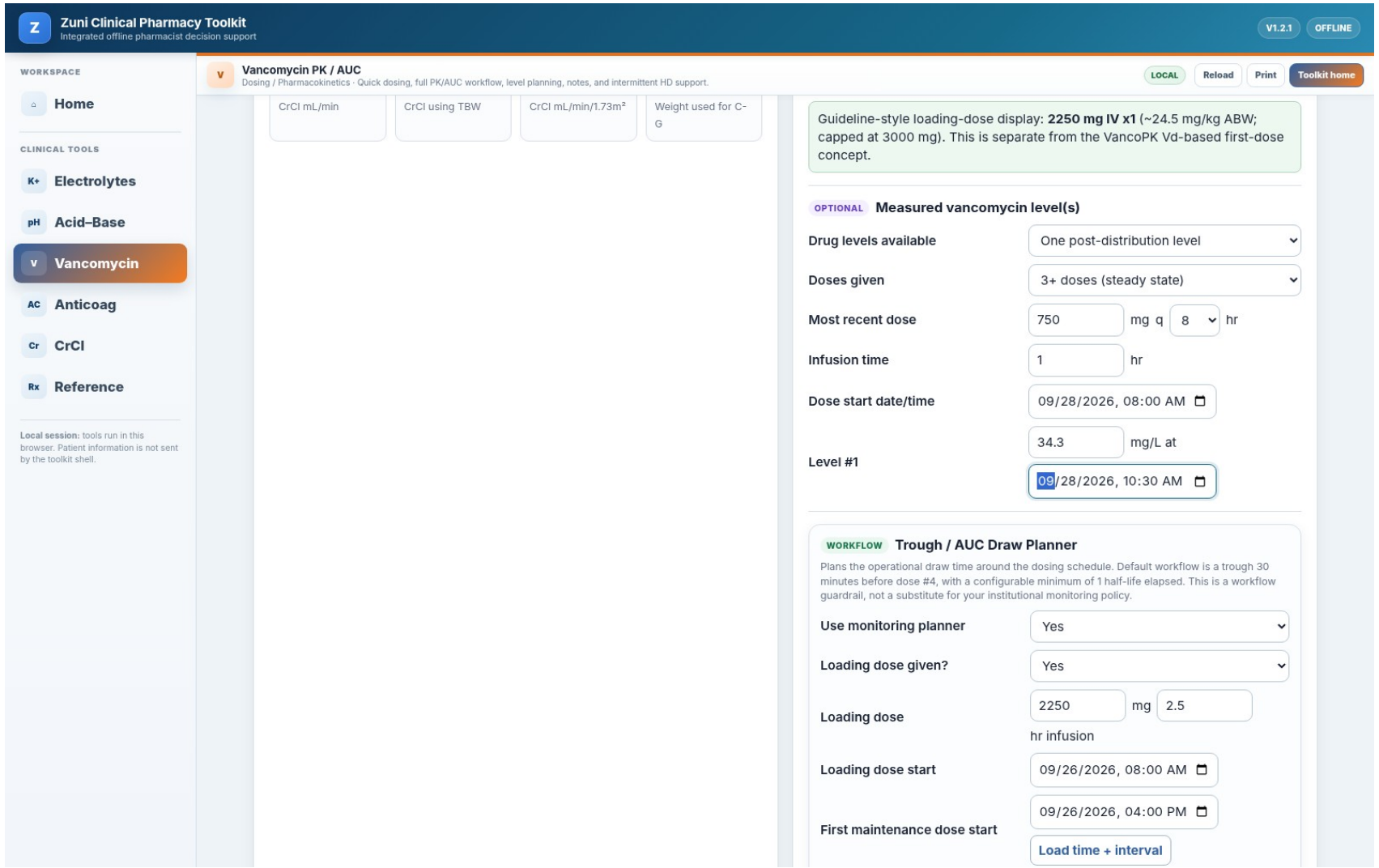
3 — Why timing matters

Measured concentrations only make sense when paired with the correct dose, infusion duration, and exact sample time.

4 — Population prediction is the reference

Before entering levels, the calculator still expects the patient's behavior from the population model.

One-level workflow: enter the concentration with its exact timing



1 — Choose one post-distribution level

Select One post-distribution level and indicate whether the patient has received 1 dose or 3+ doses.

2 — Describe the dose that produced it

Enter 750 mg q8h, 1-hour infusion, and the most recent dose start: Sep 28 at 08:00.

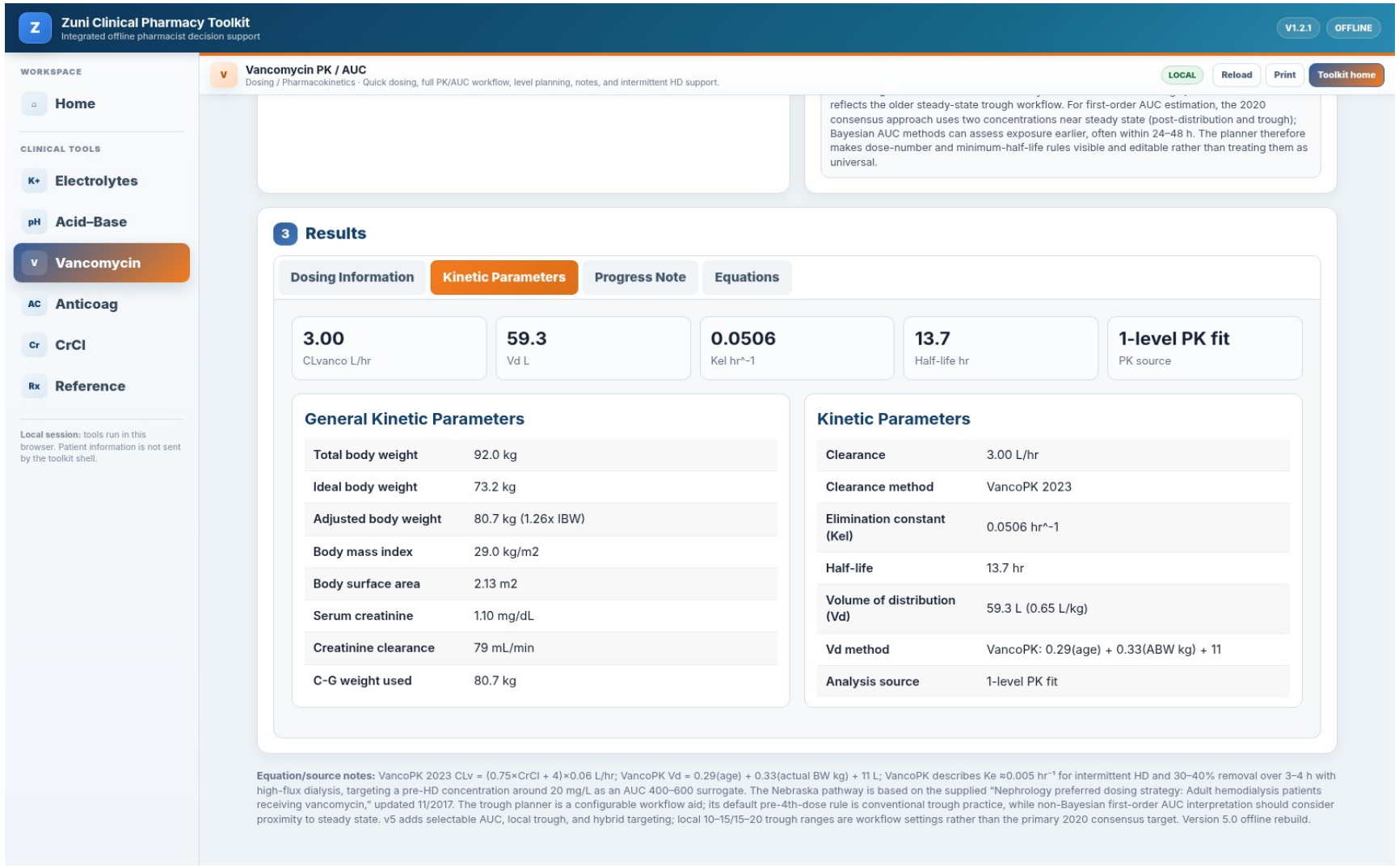
3 — Enter the measured sample

Training level #1 = 34.3 mg/L at 10:30 — 1.5 hours after the 09:00 infusion end.

4 — Distribution guardrail

The one-level fit requires the sample to be at least 60 minutes after infusion completion.

One measured level updates elimination — but holds Vd fixed



1 — Source changes

PK source now reads 1-level PK fit instead of a population estimate.

2 — What the fit solves

The tool keeps the selected population Vd fixed and iteratively solves the elimination rate that matches the measured level.

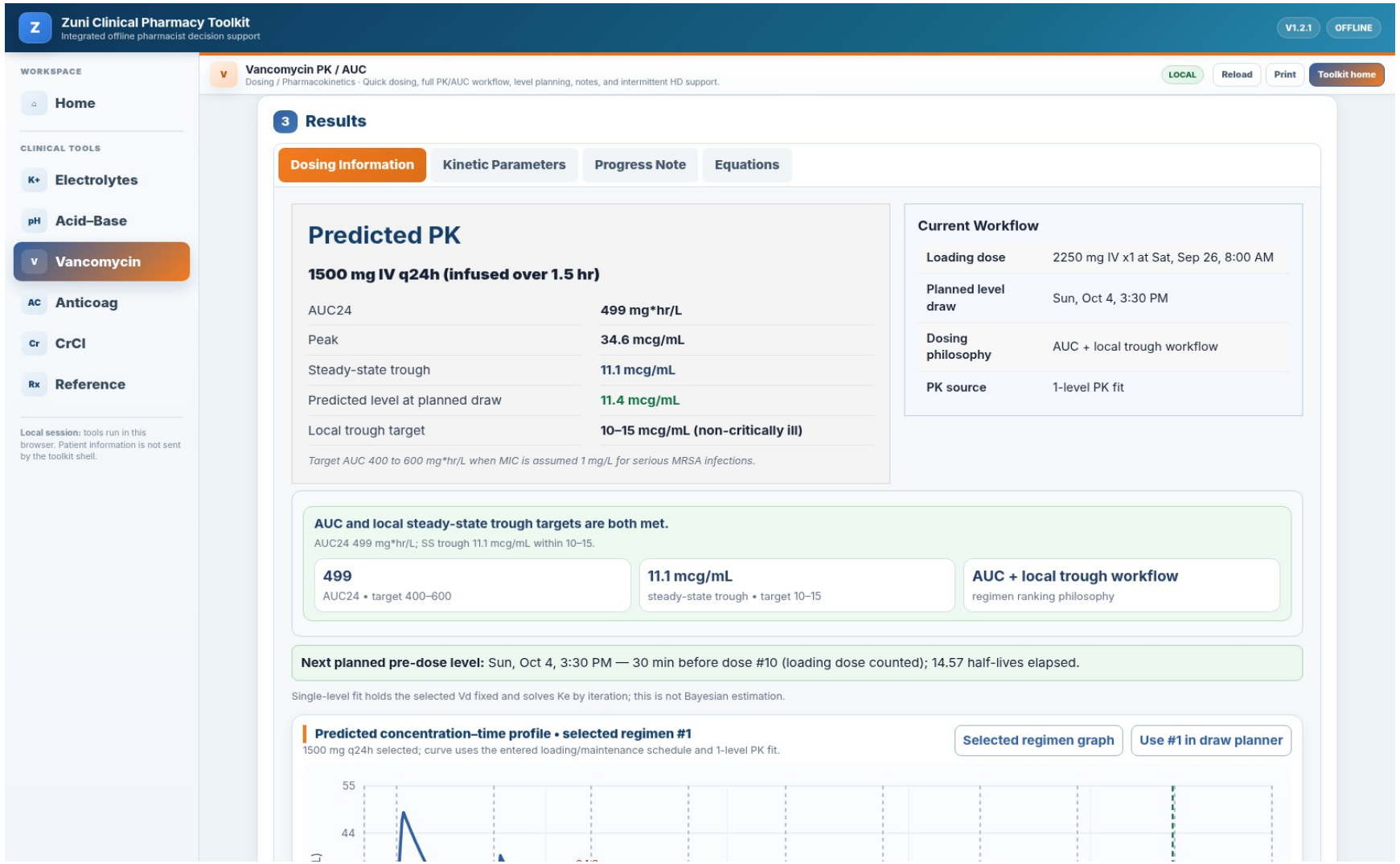
3 — Updated PK

In this training case, CL falls to about 3.00 L/hr and half-life lengthens to about 13.7 hours.

4 — Important limitation

This is a one-level, non-Bayesian fit. One concentration does not independently identify both Vd and elimination.

Recalculate: the new PK estimate changes the regimen comparison



1 — Exposure is recalculated

The regimen table is rebuilt using the updated patient-specific elimination estimate.

2 — Top-ranked regimen can change

The first displayed candidate is a new modeled option — it is not a claim that the patient already

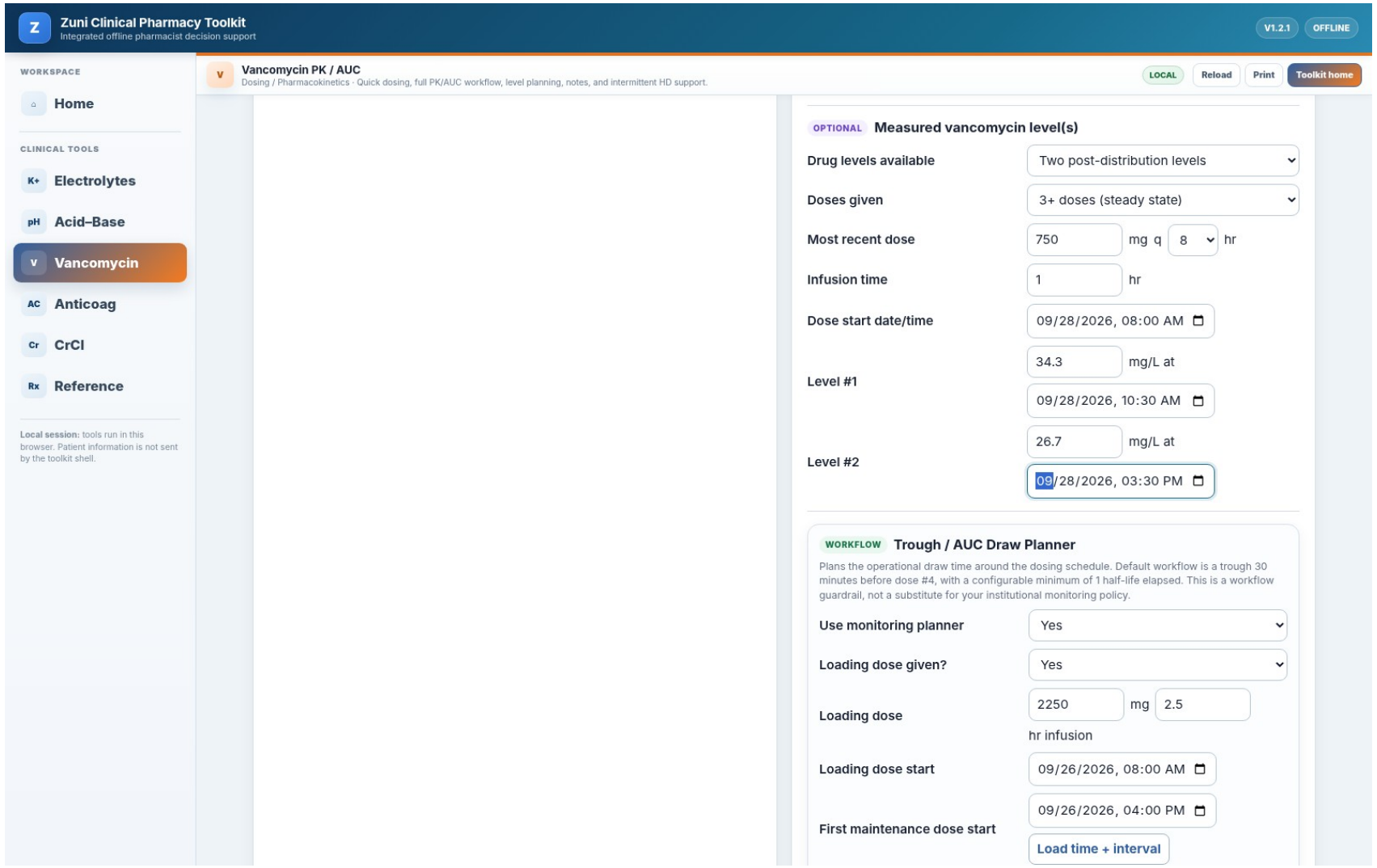
3 — Keep history separate from recommendation

The measured level came from the actual 750 mg q8h course. Future candidates are prospective choices.

4 — Why get a second level?

A second appropriately timed concentration lets the calculator estimate both Ke and Vd rather than holding Vd fixed.

Two-level workflow: pair a post-distribution level with a later level



1 — Keep the same recent dose

750 mg started at 08:00 and finished at 09:00.

2 — Level #1

34.3 mg/L at 10:30 — post-distribution and ≥60 minutes after infusion end.

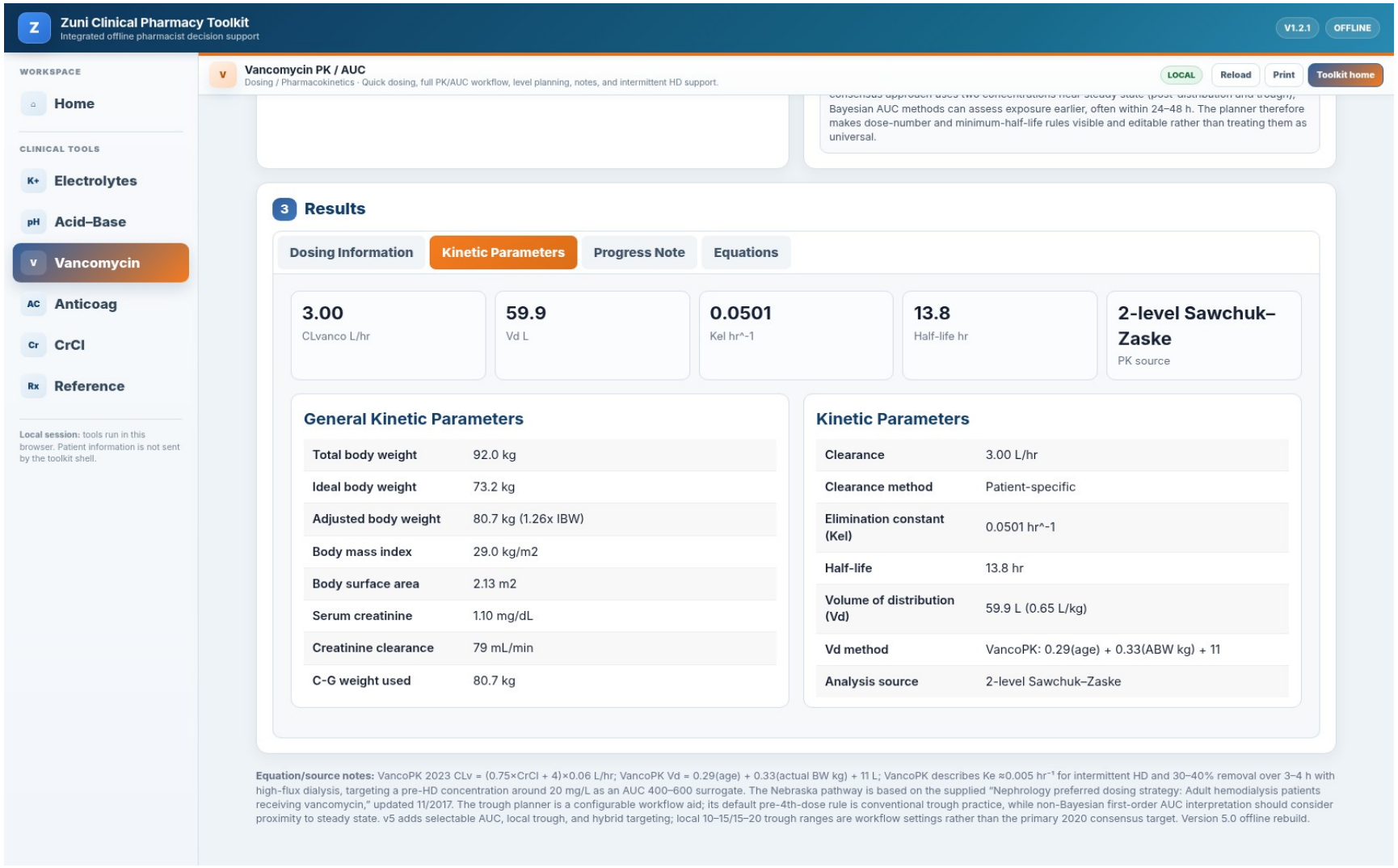
3 — Level #2

26.7 mg/L at 15:30 — five hours after level #1 and 30 minutes before the next q8h dose.

4 — Built-in timing rules

Level #1 must be higher than level #2; the two samples must be at least 4 hours apart.

Two levels produce a patient-specific first-order PK estimate



1 Method

The source changes to 2-level Sawchuk-Zaske.

2 Observed elimination

The two concentrations give Ke ≈ 0.0501 hr^{-1} and half-life ≈ 13.8 hours.

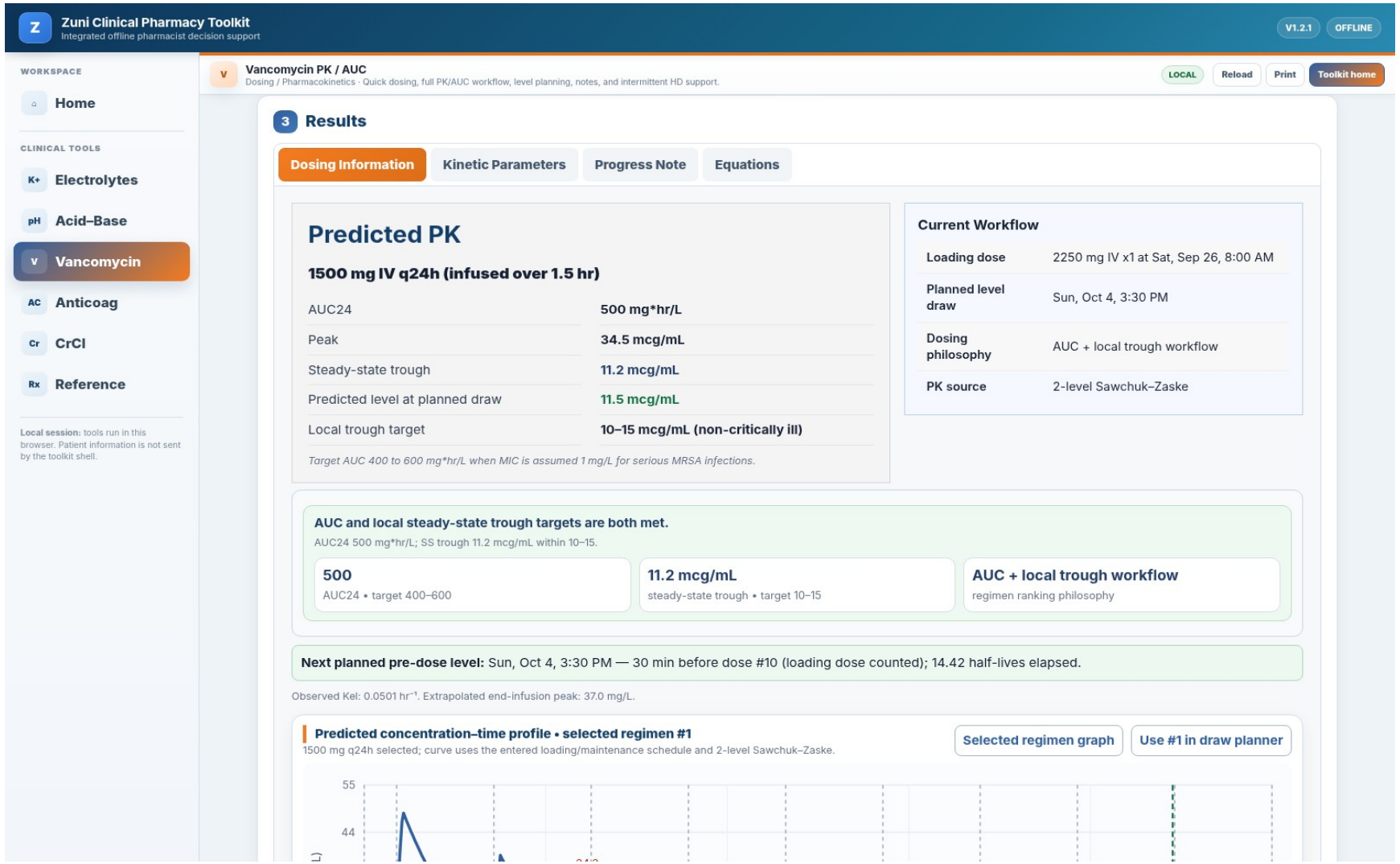
3 Patient-specific Vd

The calculation estimates Vd ≈ 59.9 L and CL ≈ 3.00 L/hr rather than fixing Vd to the population value.

4 Still first-order, not Bayesian

This method uses the entered dose and two timed concentrations. It is not a Bayesian posterior estimate.

Use the patient-specific PK to reassess exposure



1 The model has learned from the patient

PK source now reflects the measured two-level calculation.

2 Regimens are re-ranked

The displayed active candidate is the calculator's best fit to the selected target philosophy using the new PK.

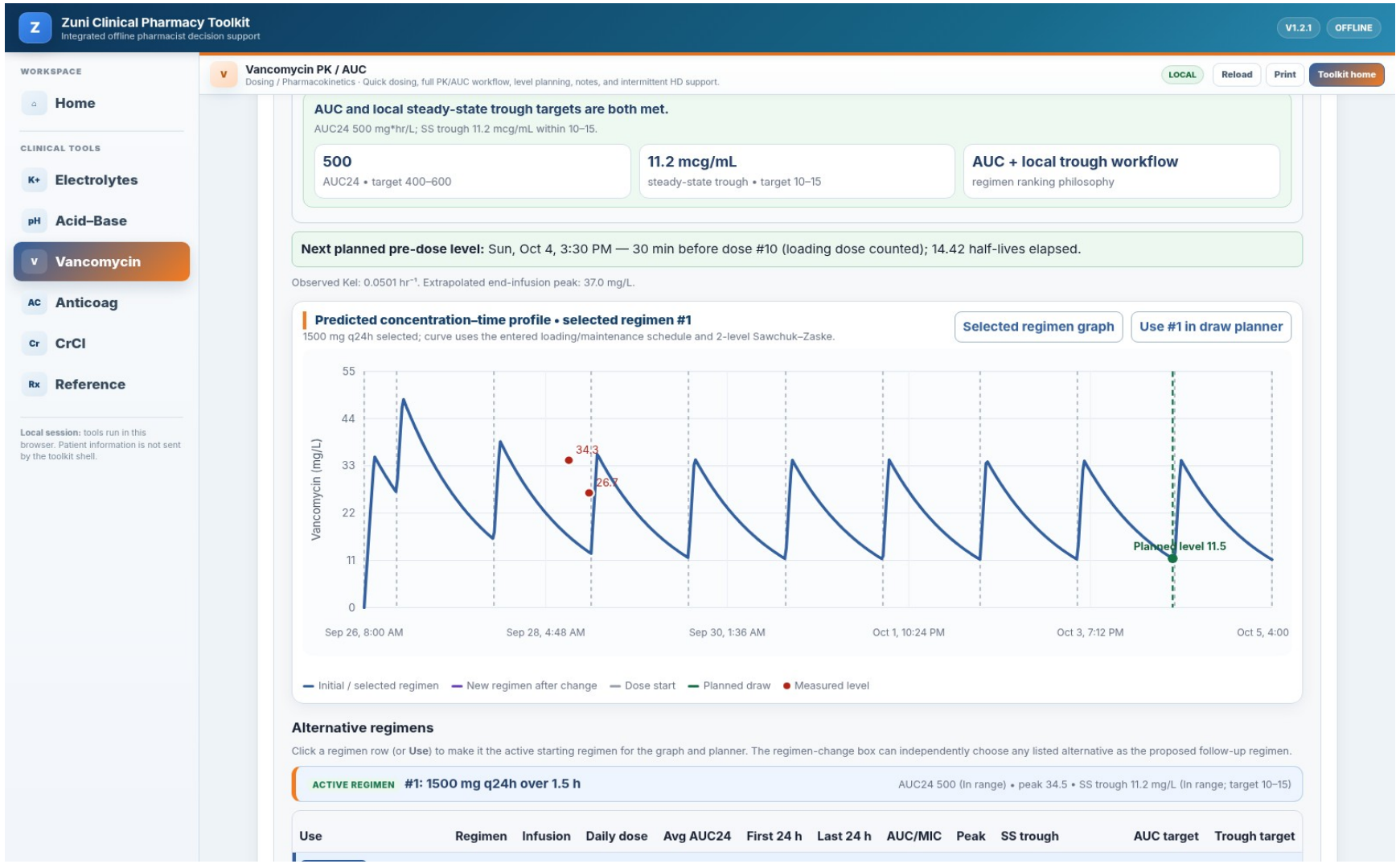
3 Do not confuse old and new regimens

The measured levels were obtained on 750 mg q8h. The newly displayed candidate is a prospective regimen.

4 This creates the Chapter 4 question

Should the regimen change, and if so, what will the new course look like?

Use the graph to connect doses, measured levels, and the modeled course



1 Dose markers

Repeated dose-start lines show where each infusion enters the modeled course.

2 Measured-level markers

The entered concentrations appear as measured points so timing can be checked against the curve.

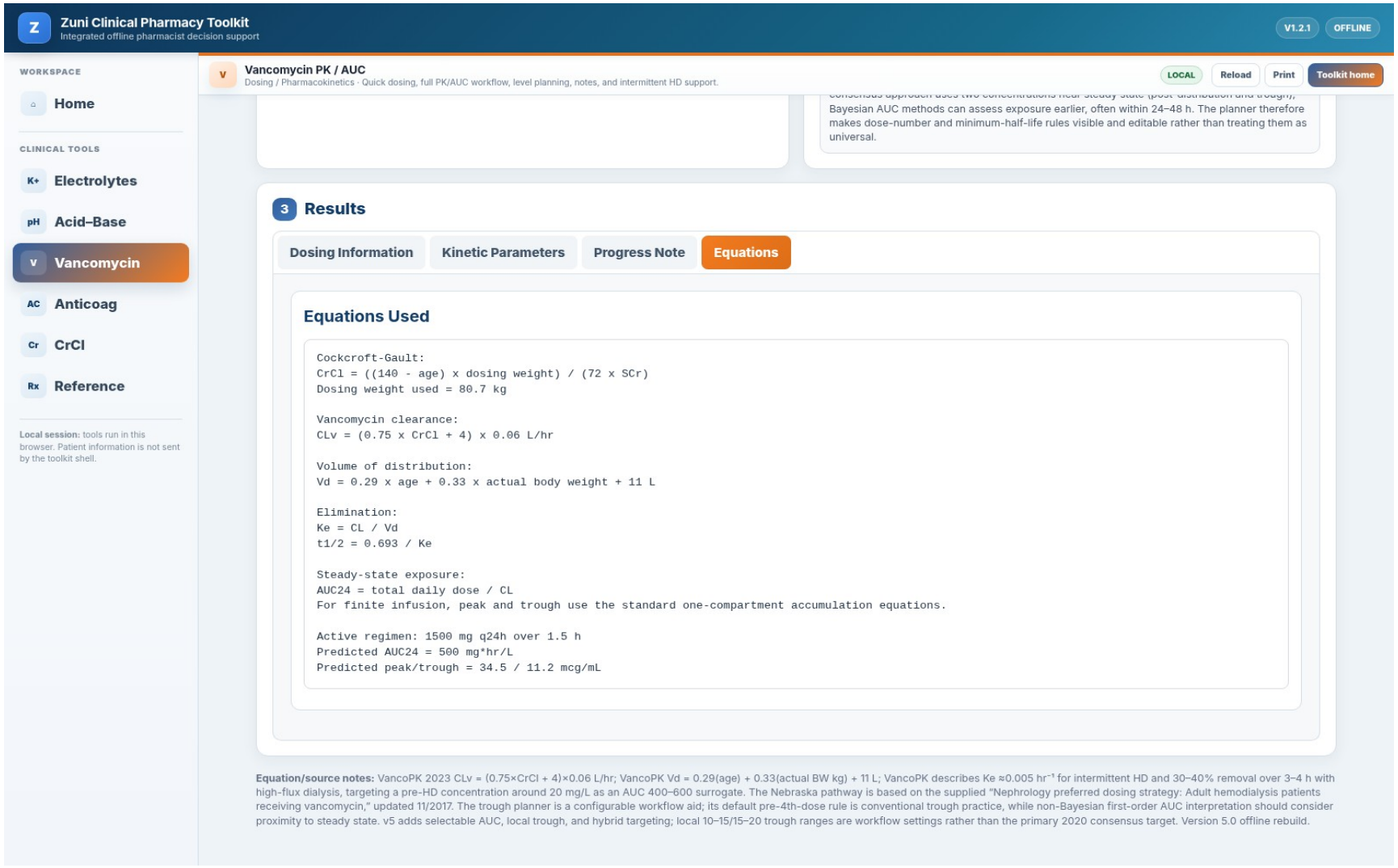
3 Planned draw remains visible

The monitoring plan can be recalculated using the updated PK estimate.

4 Look for timing errors

A measured point that is implausible relative to dose timing should prompt verification before changing therapy.

Equations shows exactly what the two-level method did



1 Log-linear elimination

Ke is calculated from the fall between level #1 and level #2 over the measured time interval.

2 Back-extrapolated peak

The post-distribution level is extrapolated back toward the end of infusion.

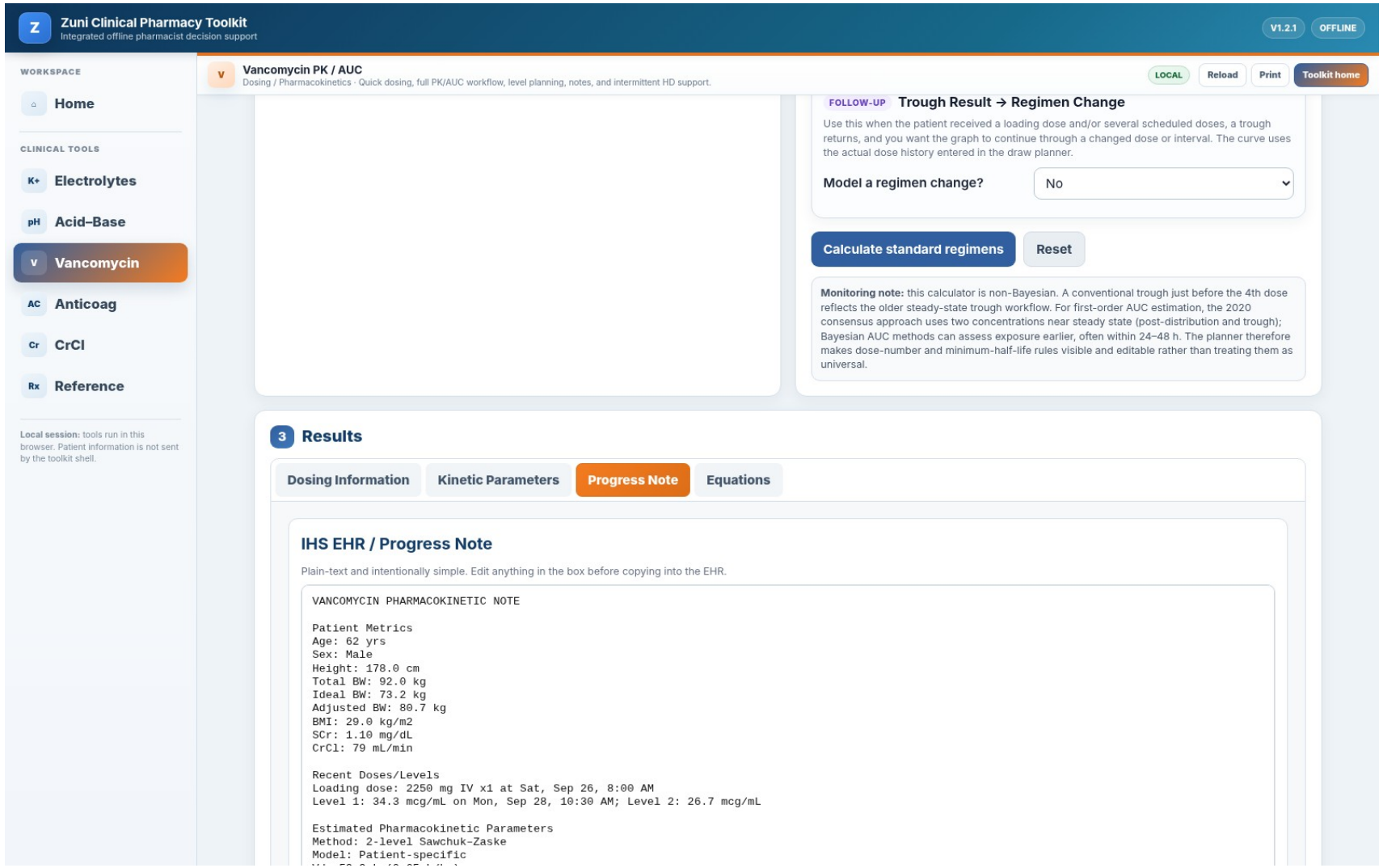
3 Vd and clearance

The entered dose, infusion time, interval, and concentration pair are then used to estimate Vd and CL.

4 Use this tab for audit

If the output seems unexpected, verify the times and concentrations here before accepting the PK estimate.

Progress Note converts the analysis into an EHR-ready summary



1 Patient metrics

The note carries forward demographics, renal function, and weight calculations.

2 Measured levels

The entered concentrations and patient-specific PK method are documented.

3 Dosing / monitoring

The selected modeled regimen and next monitoring plan are summarized for review.

4 Review before copying

Confirm actual doses, sample times, renal trend, indication, and plan before placing generated text in the EHR.

Choose the level workflow that matches the data you actually have

1

No measured levels

Use population PK for initial dosing and planning. The output is a prediction, not patient-specific observed PK.

2

One post-distribution level

The calculator holds Vd fixed and fits Ke to the single concentration. Useful information, but limited.

3

Two post-distribution levels

With appropriate timing, the first-order method estimates Ke and Vd from the concentration pair.

4

Timing is part of the data

Dose start, infusion end, sample times, interval, and number of doses are not optional context — they define the calculation.

5

Neither workflow is Bayesian

The calculator does not provide Bayesian AUC estimation. Do not describe these results as Bayesian.

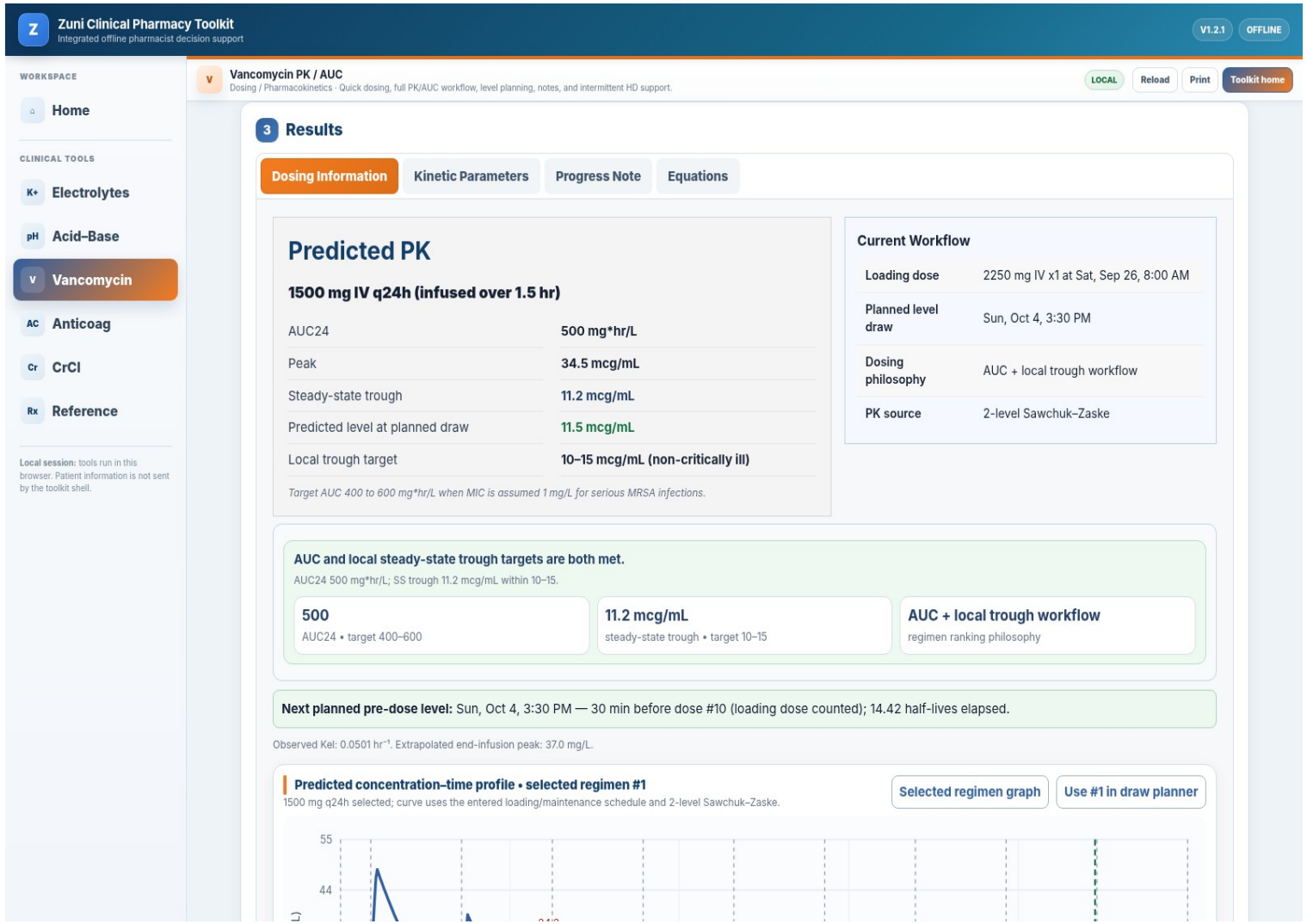
6

Clinical interpretation still matters

Renal trajectory, cultures, indication, toxicity risk, administration accuracy, and institutional policy remain outside the math.

When the data are questionable, verify the dose and draw history before trying to make the concentrations fit.

Chapter 3 endpoint: measured PK is ready for a regimen decision



1 — What we now know

The patient's measured concentrations suggest slower clearance than the original population estimate.

2 — What changed

The calculator has rebuilt the candidate regimens using the two-level patient-specific PK.

3 — What we have not done

We have not yet committed to a new dose or interval. The displayed candidate is still a modeled option.

4 — Next: Chapter 4

Use the measured PK and actual course to model a regimen change, graph old vs. new therapy, and plan the next level.

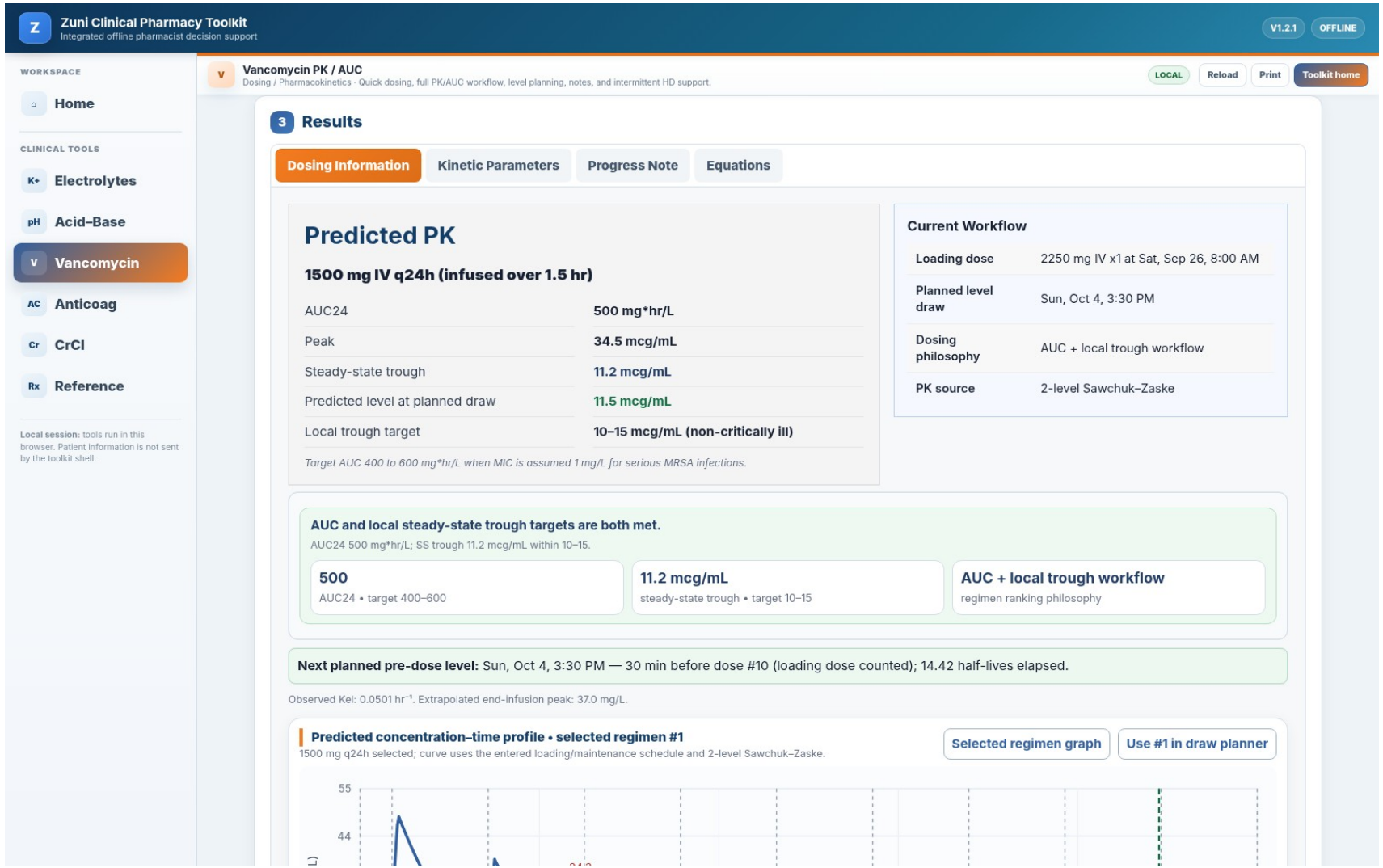
Vancomycin PK / AUC

Chapter 4 — Regimen Adjustment & Longitudinal Course

Turn the measured PK from Chapter 3 into a prospective regimen change without losing the patient's actual dosing history.

Training decision: 750 mg q8h produced the measured levels; model a change to 750 mg q12h.

Start where Chapter 3 ended: measured PK, not a blank patient



1 — Actual regimen

The measured concentrations came from 750 mg IV q8h. That remains the historical regimen.

2 — Patient-specific PK

The two-level calculation estimated CL about 3.0 L/hr and half-life about 13.8 hours.

3 — Candidate ≠ administered dose

The calculator may display a newly ranked candidate after PK is updated. Do not rewrite the dose history to match it.

4 — Now model the change

Use Trough Result → Regimen Change to join the old course to a prospective new regimen.

Open Trough Result → Regimen Change and describe the decision

FOLLOW-UP Trough Result → Regimen Change

Model a regimen change?
Yes

Observed trough
26.7 mg/L at Sep 28, 3:30 PM

Use trough to update PK?
No — keep current PK estimate

Proposed new regimen
Manual entry

New dose / interval
750 mg q12 hr

New infusion time
1.0 hr

First new-regimen dose
Sep 28, 4:00 PM

Next trough rule
30 min before new dose #4; ≥1 half-life

Plot course + calculate change

1

Use the observed trough

Enter the measured pre-dose concentration and its exact collection time.

2

Keep the Chapter 3 PK

This trough already participated in the two-level patient-specific fit, so fitting it again would reuse the same information.

3

Enter the prospective regimen

The new regimen begins at the next scheduled dose time. Nothing before that point is changed.

Use the trough-fit option only when it adds new information

1

Keep current PK — this case

Choose this when the current PK already incorporates the measured concentration(s), as it does after our Chapter 3 two-level calculation.

2

Fit Ke to this trough

Use when the returned trough is new information and the current model has not already incorporated it. The tool holds Vd fixed and fits Ke to the full entered dose history.

3

Not Bayesian

The course fit is a one-level, fixed-Vd calibration. It should not be described as Bayesian AUC estimation.

4

Avoid double-counting

Do not take a trough already used in the two-level PK calculation and then treat the same trough as an independent new PK update.

5

Dose history is essential

The fit uses the loading dose and scheduled maintenance history from the draw planner. Incorrect administration times produce an incorrect fitted Ke.

6

If the trough cannot be reconciled

Recheck dose times, infusion times, sample time, and concentration before forcing a model to fit.

Read the modeled change as a prospective plan

MODELED REGIMEN CHANGE

Current patient-specific PK → 750 mg q12h

500
new steady-state AUC24

15.6 mcg/mL
new steady-state trough

Sep 30, 3:30 AM
next planned pre-dose level

17.8 mcg/mL
predicted level at next draw

Interpretation
The new steady-state metrics describe repeated 750 mg q12h dosing. The next-draw prediction also includes residual drug from the prior q8h course.

1

AUC falls into target

With CL ≈3.0 L/hr, 750 mg q12h predicts AUC24 ≈500 mg·h/L.

2

Steady-state trough is separate

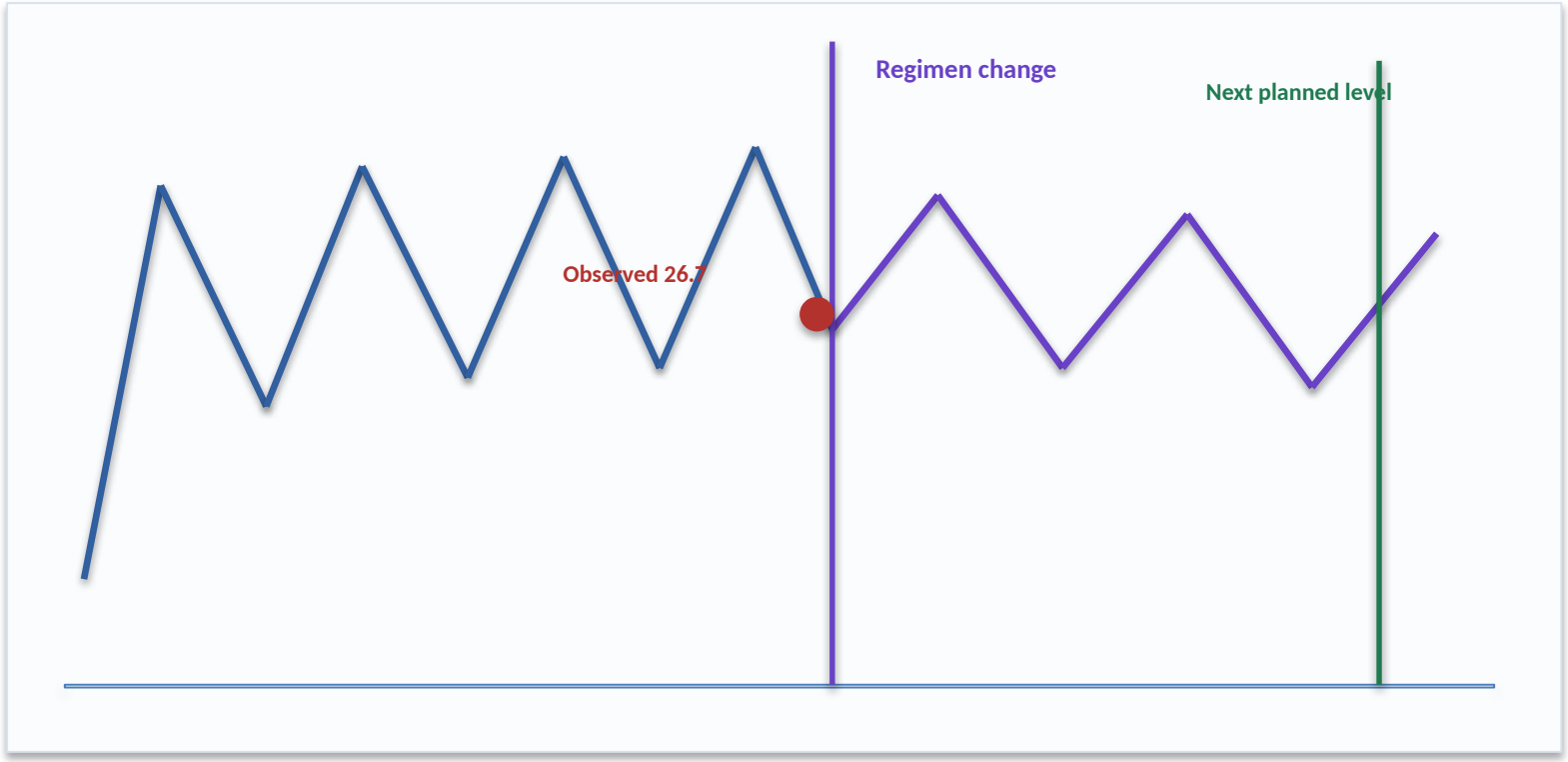
15.6 mcg/mL is the eventual q12h steady-state trough — not the concentration expected at the first follow-up draw.

3

Residual drug matters

The predicted next level remains higher because the patient enters the new regimen with drug accumulated from q8h dosing.

The longitudinal graph joins what happened to what you propose next



1

Blue = prior course

The initial segment reflects the loading dose and 750 mg q8h history.

2

Purple = proposed course

The curve changes only from the first new-regimen dose forward.

3

Markers anchor the story

Observed trough and next planned level remain visible so the transition is clinically interpretable.

The longitudinal view is most useful when the entered administration history matches what the patient actually received.

Plan the next level from the new regimen — without forgetting the old regimen

NEXT TROUGH ON NEW REGIMEN

First new-regimen dose
Sep 28, 4:00 PM

New regimen
750 mg q12h over 1 hr

Requested rule
30 min before new dose #4

Minimum elapsed time
1 half-life

Recommended draw
Sep 30, 3:30 AM

Predicted concentration
≈17.8 mcg/mL

Why 17.8 is not 15.6
15.6 mcg/mL is the new q12h steady-state trough. The first follow-up draw occurs during the transition and still contains residual contribution from prior q8h doses.

1

The planner follows the change

The next level is tied to the new dose schedule, not the original q8h interval.

2

Guardrail can move the draw

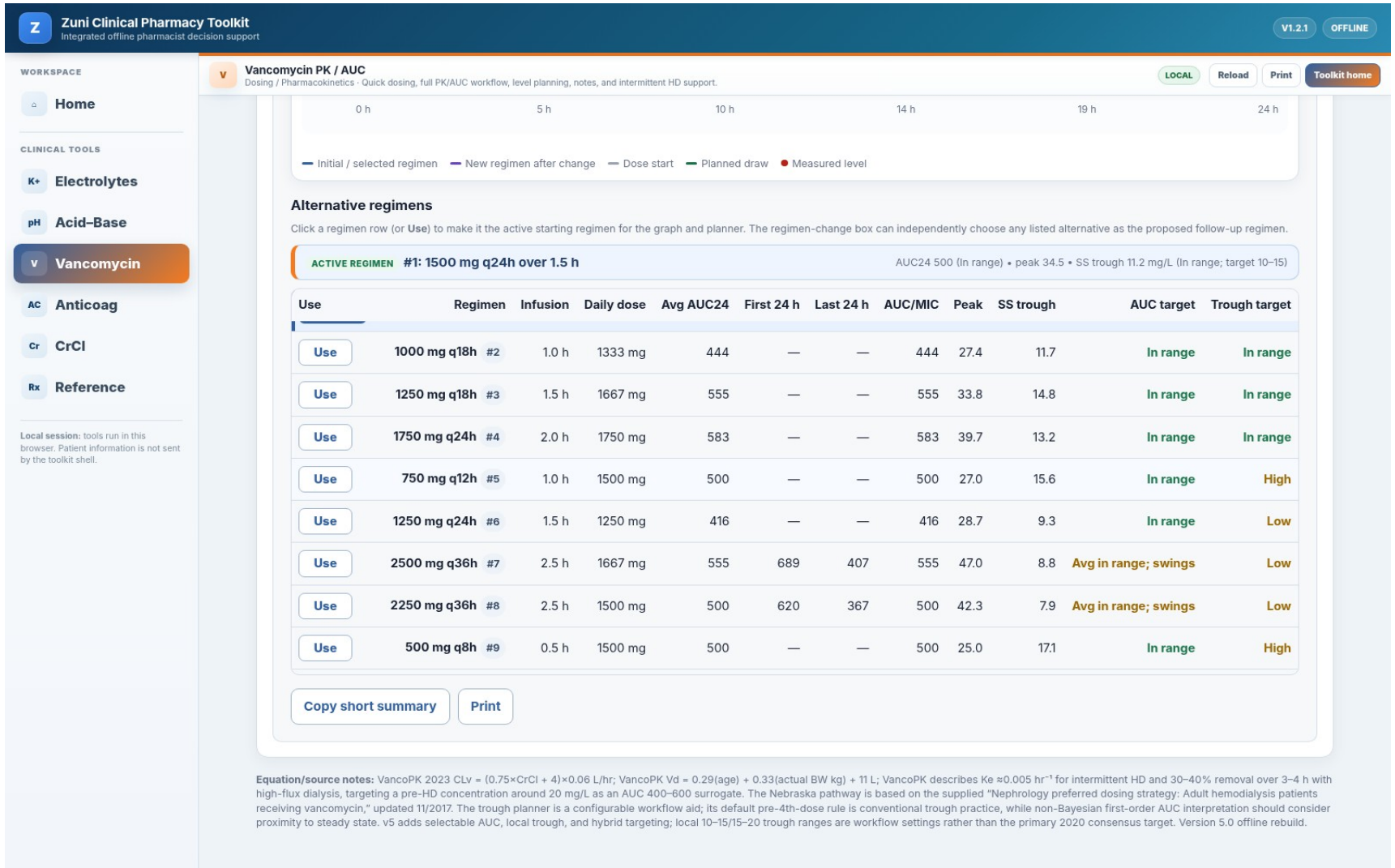
If the requested sample is earlier than the minimum-half-life rule, the tool advances it by dosing intervals.

3

Interpret transition levels carefully

An early post-change trough should not automatically be treated as the new regimen's steady-state trough.

Use active regimen as proposed when the candidate table already has your choice



1 Candidate table

After patient-specific PK is calculated, the tool ranks alternative maintenance regimens.

2 Select intentionally

Choose a regimen only after confirming that its AUC, trough, interval, and clinical context are acceptable.

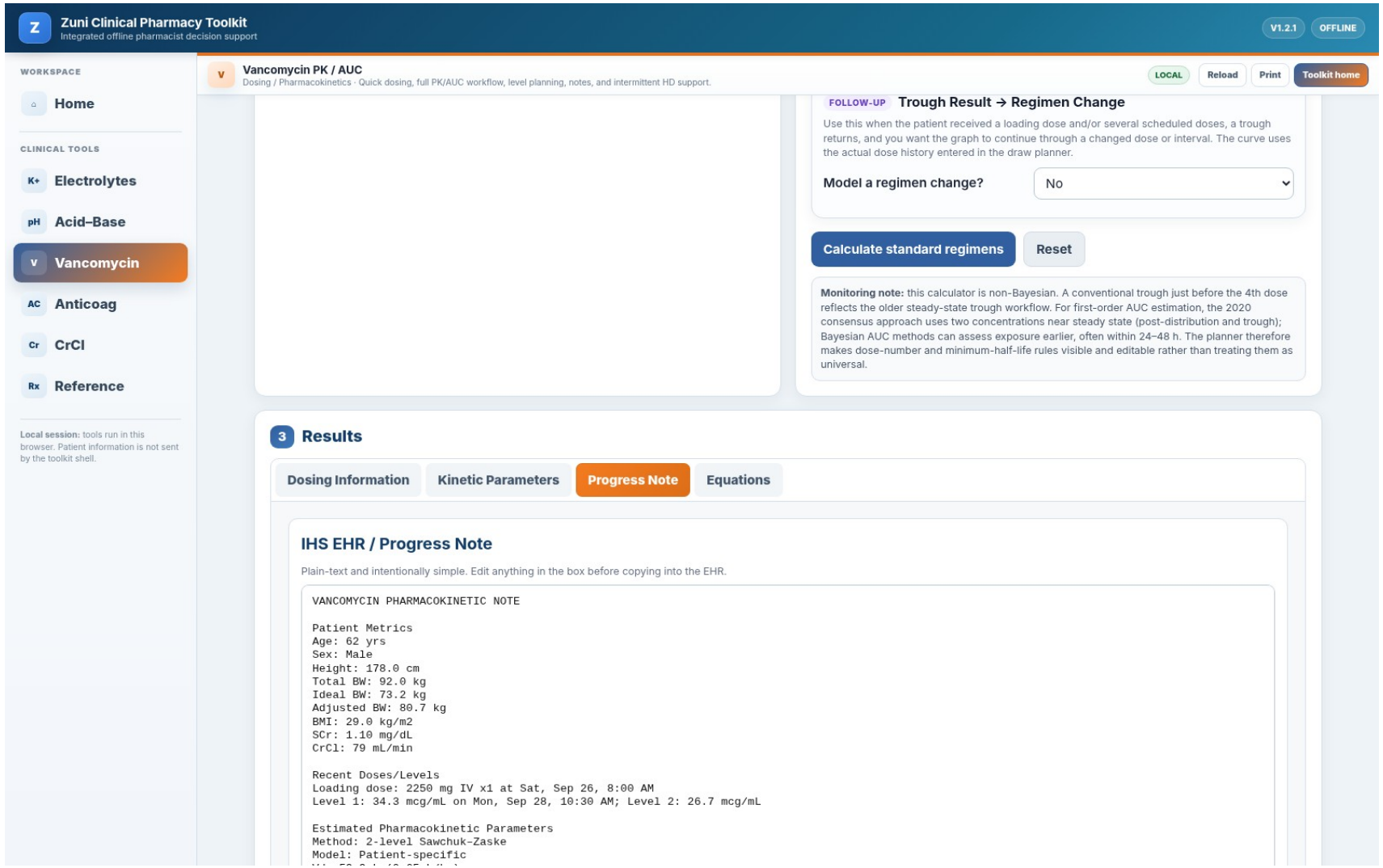
3 Shortcut, not history

Use active regimen as proposed can populate the follow-up box. It does not mean the patient has already received it.

4 Then set the start time

The regimen change is not defined until the first new-regimen dose time is established.

Refresh the Progress Note after the regimen-change model is complete



1 PK context

The note preserves the patient-specific PK and measured-level information from Chapter 3.

2 Follow-up regimen

After the course calculation, the follow-up section can document the modeled new dose/interval and next level plan.

3 Refresh before copying

If you change the regimen or monitoring plan, refresh the calculator-generated note so it reflects the final model.

4 Verify against the MAR/EHR

Generated text is a starting point. Confirm what was actually administered and collected before signing.

Four checks before accepting a longitudinal regimen change

1

1. Historical doses are historical

Loading dose and prior maintenance doses must match the actual administration record. Never edit history simply to make the graph look cleaner.

2

2. A measured level needs a timestamp

A concentration without the correct collection time cannot be interpreted reliably in a first-order PK model.

3

3. Do not double-use the same level

If a trough already helped generate the current patient-specific PK, do not automatically fit the same trough again as though it were new evidence.

4

4. Proposed dosing starts in the future

The new regimen begins at the entered first-new-dose time. Before that point, the graph should remain the prior regimen.

5

Steady-state metrics are not transition metrics

New SS AUC/trough describe repeated new dosing; the first post-change level may still reflect residual prior therapy.

6

Clinical judgment remains outside the curve

Renal trend, cultures, response, toxicity, access, administration feasibility, and institutional policy still matter.

Chapter 4 endpoint: the non-HD course is now complete

1 **Initial dosing**

Population PK produced the starting loading and maintenance plan.

2 **Measured PK**

One- and two-level workflows converted observed concentrations into patient-specific first-order PK.

3 **Regimen change**

The longitudinal tool preserved the old course, modeled 750 mg q12h prospectively, and planned the next level.

4 **What the pharmacist should retain**

Actual dose history, measured levels, PK source, proposed regimen, start time, and follow-up level timing should tell one consistent story.

5 **Do not treat the model as an order**

The calculator supports the dosing decision; it does not replace institutional policy, clinical assessment, or order verification.

6 **Next: Chapter 5**

Intermittent high-flux hemodialysis uses a separate workflow with different assumptions and dosing logic.

Chapter 5 starts a separate fictitious HD patient rather than forcing the non-HD case into a dialysis workflow.

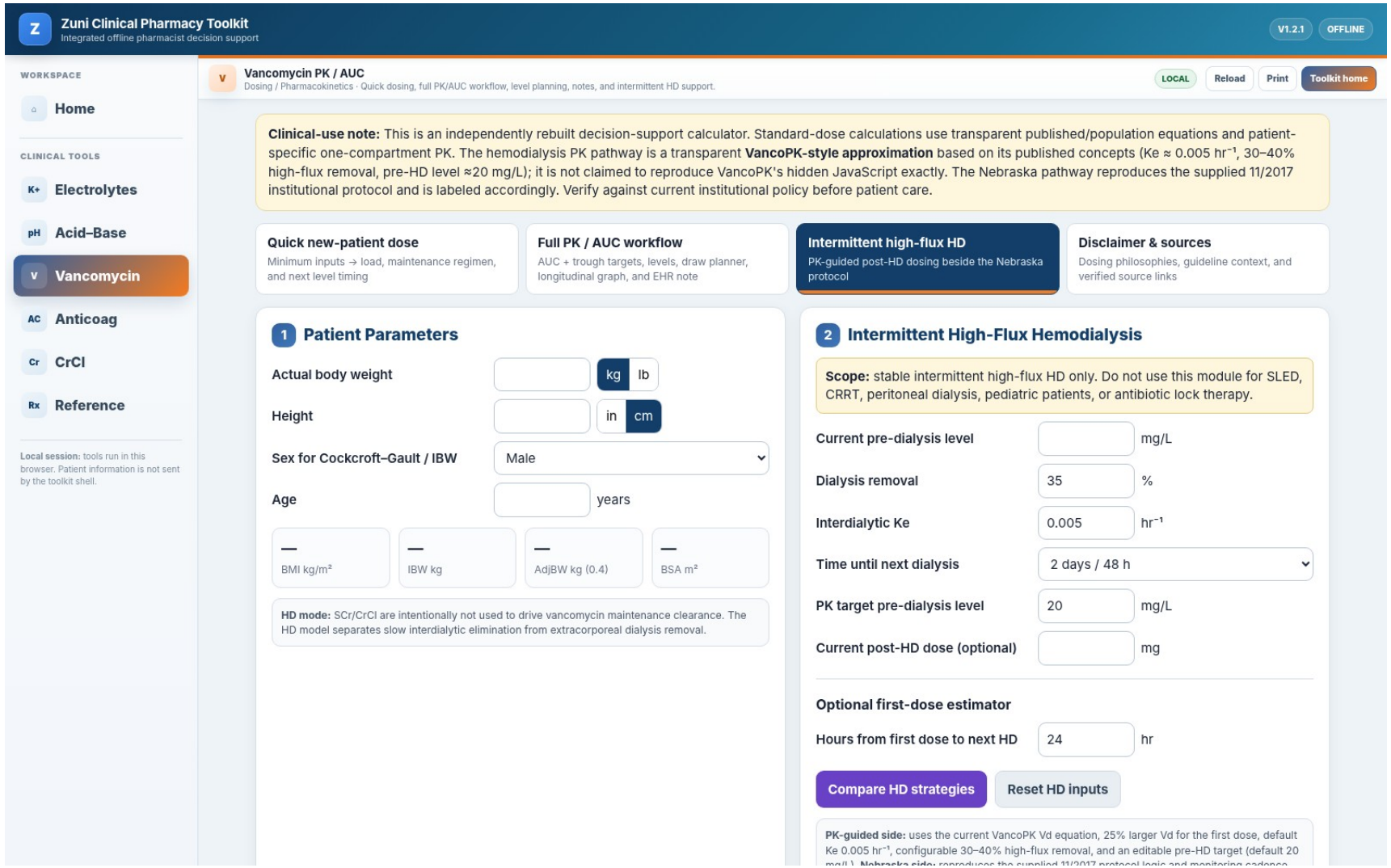
Vancomycin PK / AUC

Chapter 5 — Intermittent High-Flux Hemodialysis

A separate workflow for stable intermittent high-flux HD: pre-HD concentration → dialysis removal → post-HD dose → next pre-HD prediction.

New fictitious patient: 67-year-old male • 80 kg • 175 cm • stable intermittent high-flux HD

Choose the HD workflow only for the dialysis setting it was built to model



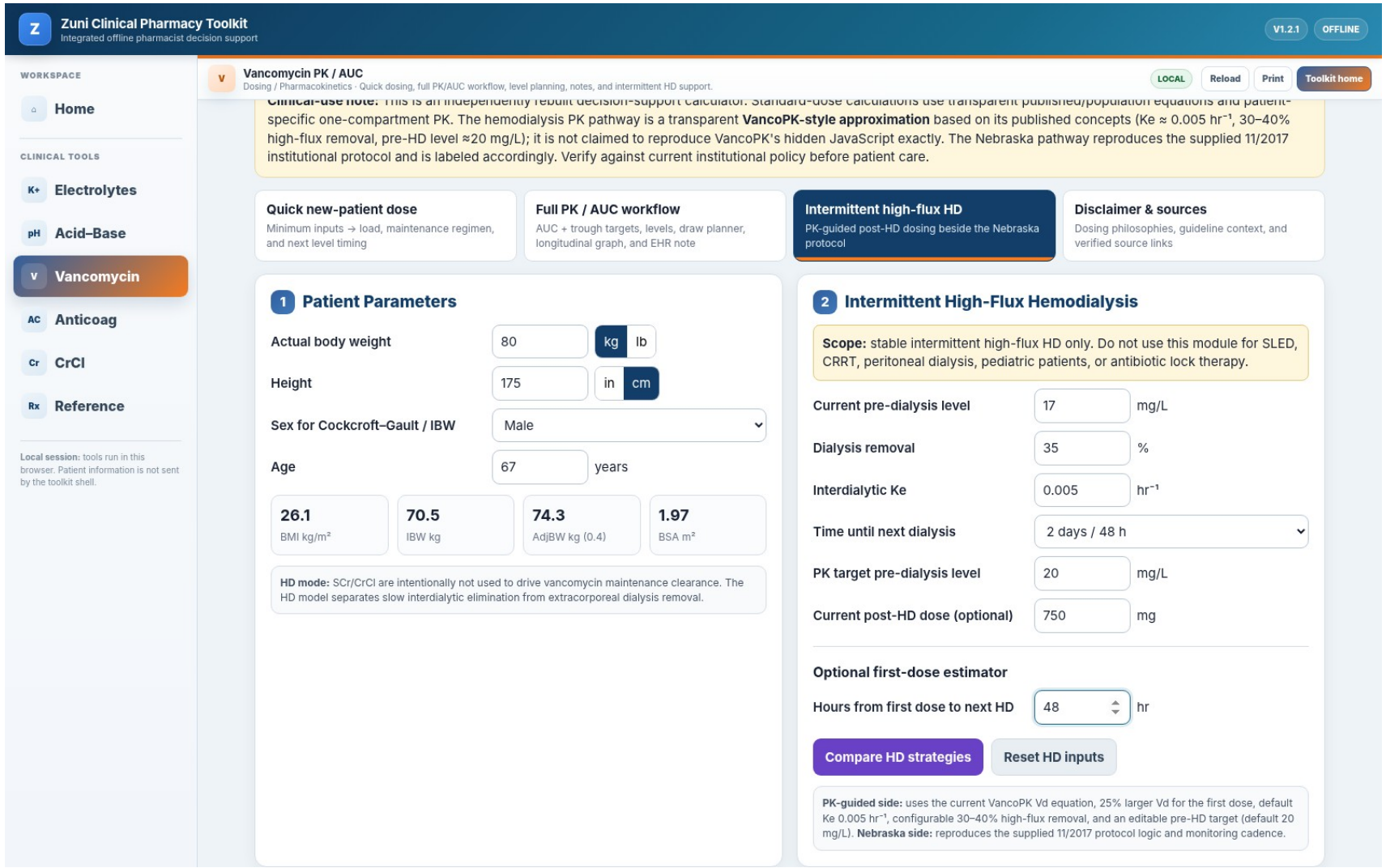
1. **Select Intermittent high-flux HD**
   This is a separate mode from the standard CrCl-driven PK/AUC workflow.

2. **Scope is intentionally narrow**
   Use for stable intermittent high-flux HD. The tool explicitly excludes SLED, CRRT, peritoneal dialysis, pediatric patients, and antibiotic-lock therapy.

3. **SCr/CrCl are not the driver**
   The HD model separates slow interdialytic elimination from extracorporeal removal rather than using CrCl for maintenance clearance.

4. **Two strategies are shown**
   The tool places a PK-guided approximation beside a legacy Nebraska Medicine 11/2017 protocol comparison.

Enter patient size and the current pre-HD situation



1 Patient parameters

Weight, height, sex, and age are used for body-size calculations and the HD Vd estimate.

2 Pre-HD level

Training concentration = 17 mg/L immediately before dialysis.

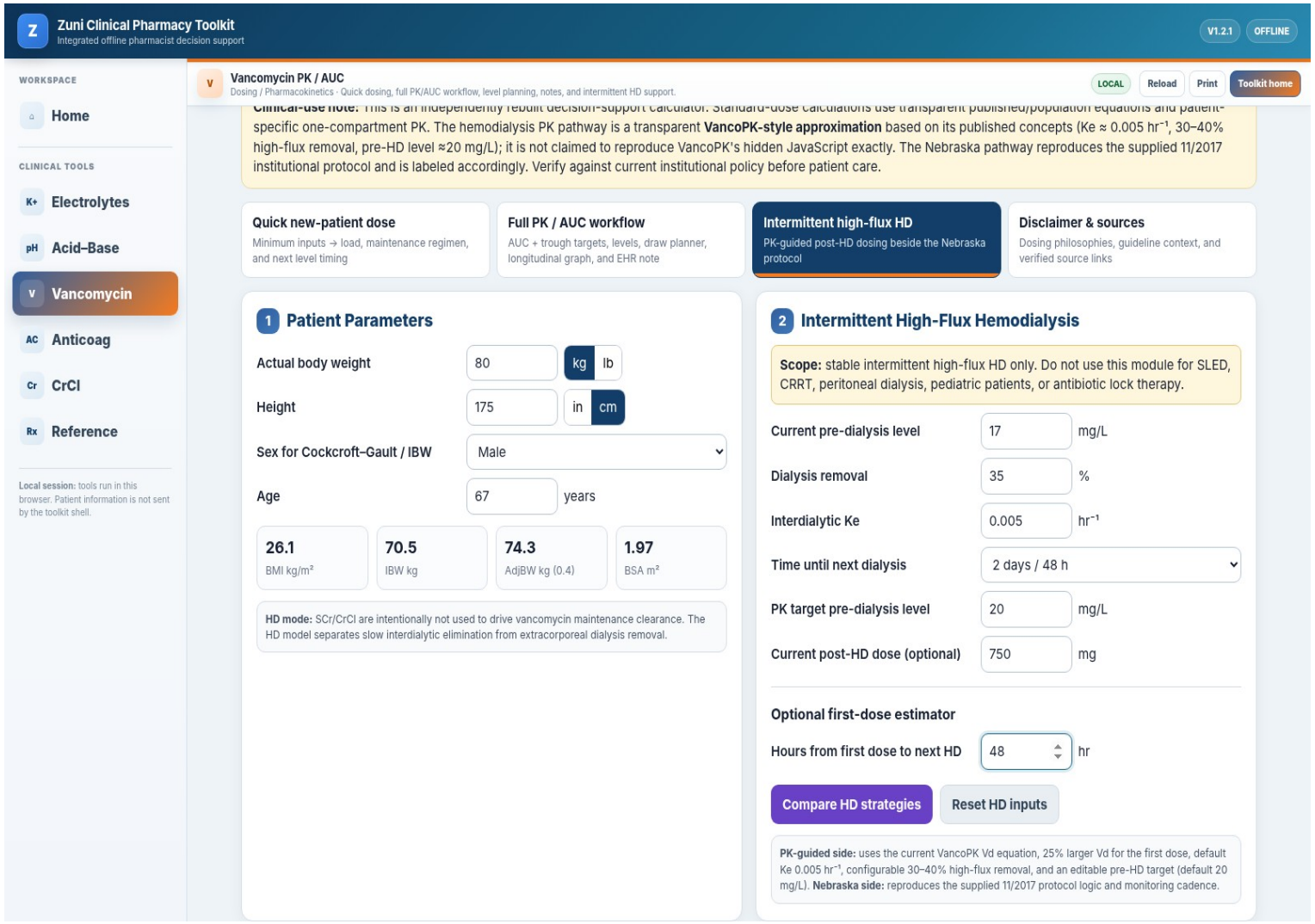
3 HD assumptions

Default high-flux removal is 35% and interdialytic Ke is 0.005 hr^{-1}. Change these only when you have a defensible reason.

4 Interval matters

Choose the actual time to the next HD session: 24, 48, 72, or 96 hours.

The practical monitoring target is the next pre-HD concentration



1 — Default target = 20 mg/L

The PK side works backward from the desired concentration before the next HD session.

2 — Why pre-HD monitoring?

Current consensus guidance considers pre-HD concentration monitoring the most practical approach in intermittent HD; 15–20 mg/L is used as a surrogate likely to correspond to AUC24 400–600 when MIC ≤1 mg/L.

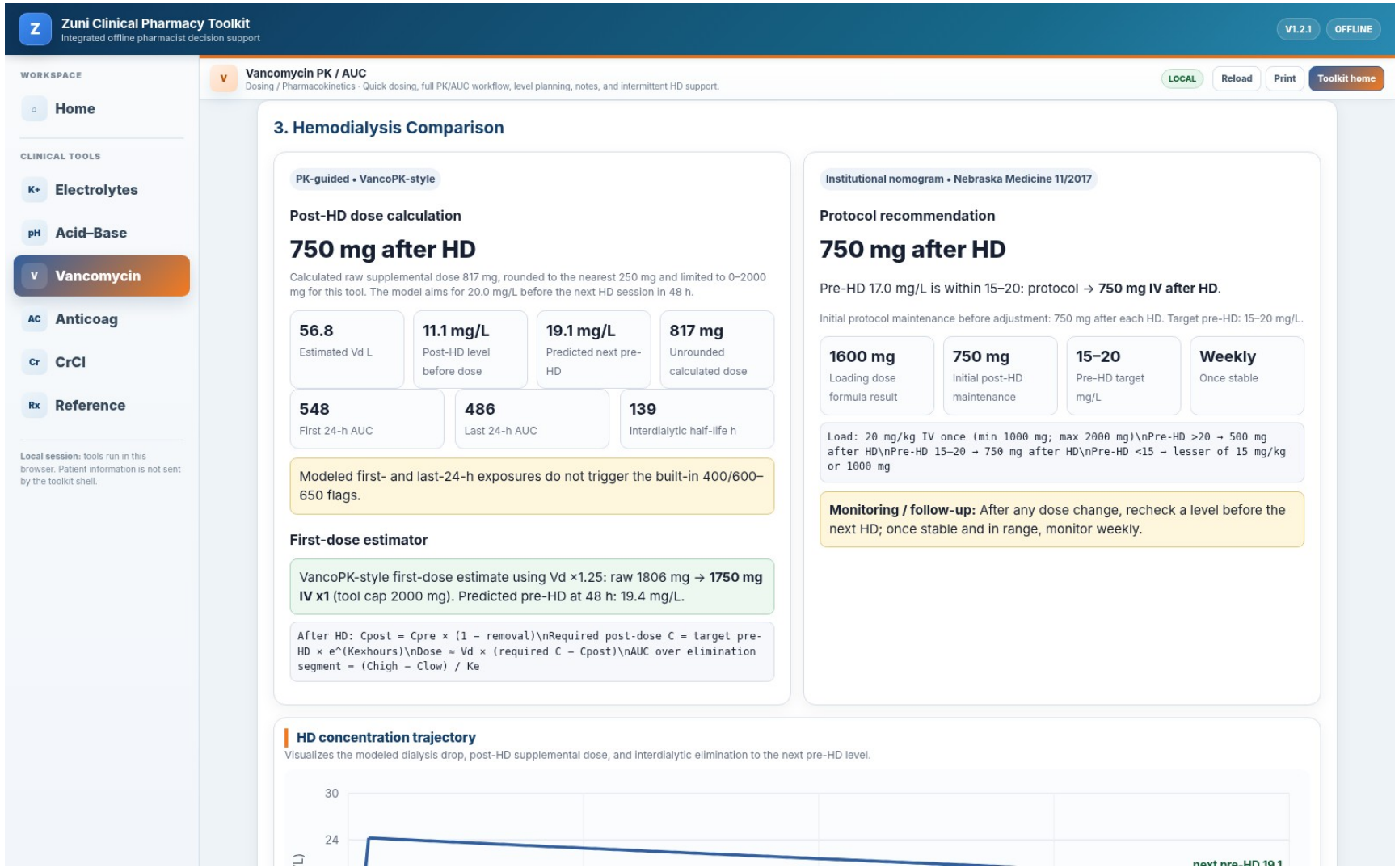
3 — Current dose is optional

Entering the current post-HD dose helps the legacy protocol's follow-up logic explain whether another 250-mg adjustment is suggested.

4 — Then compare

Select Compare HD strategies only after confirming the level, interval, and assumptions.

48-hour example: read the PK-guided post-HD calculation



1 — Recommended post-HD dose

For this training case, the PK side calculates 750 mg after HD.

2 — Follow the concentration steps

17 mg/L pre-HD → about 11.1 mg/L after 35% dialysis removal → dose added → predicted next pre-HD about 19.1 mg/L.

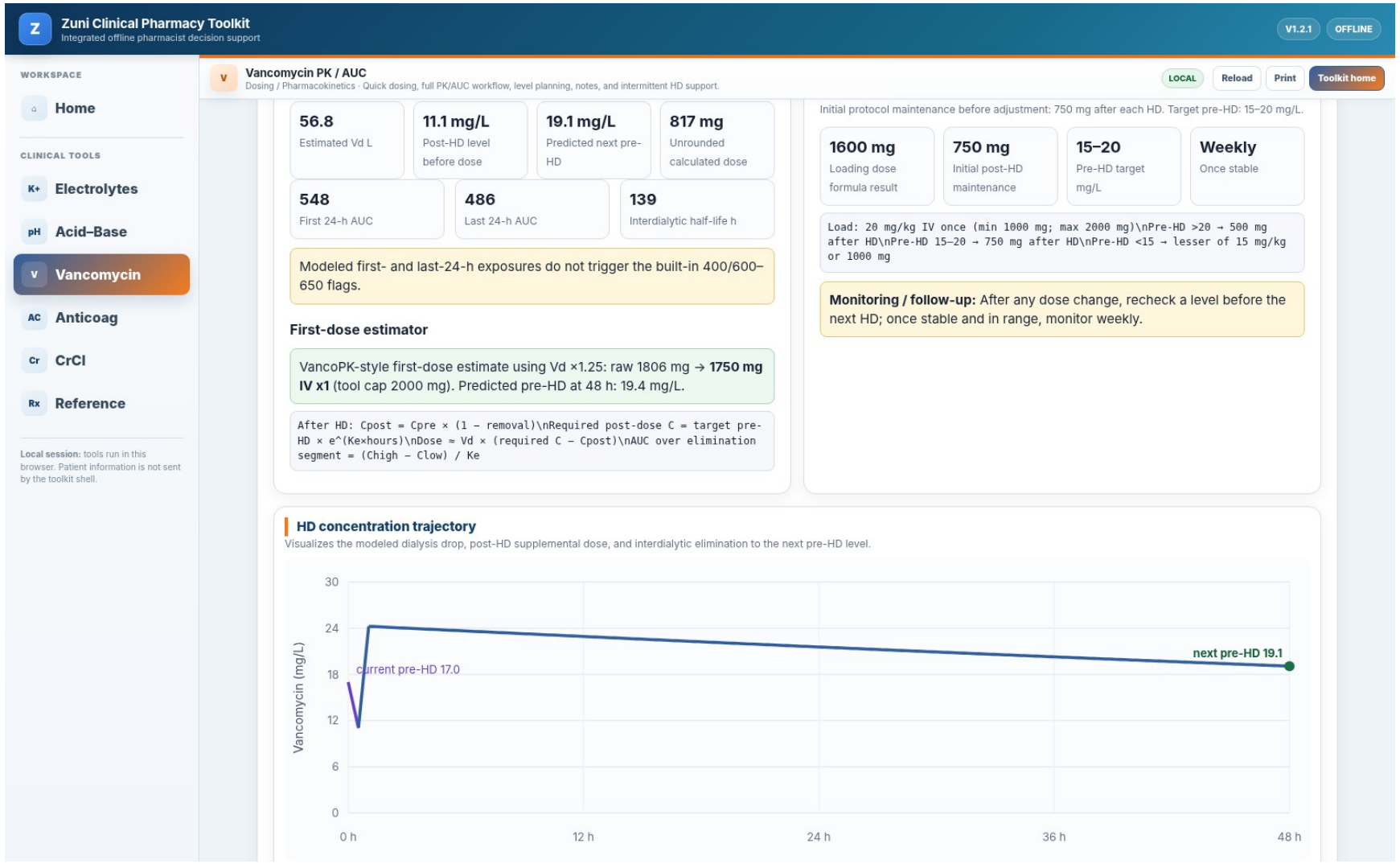
3 — Raw vs practical dose

The raw calculation is about 817 mg; the tool rounds to a practical 250-mg increment.

4 — Exposure flags

The tool also estimates first- and last-24-hour AUCs and flags modeled exposure outside its built-in ranges.

Use the HD trajectory to understand what the dose is doing



1 Purple drop

The immediate drop represents modeled extracorporeal removal during HD.

2 Blue rise

The post-HD vancomycin dose raises the modeled concentration after dialysis.

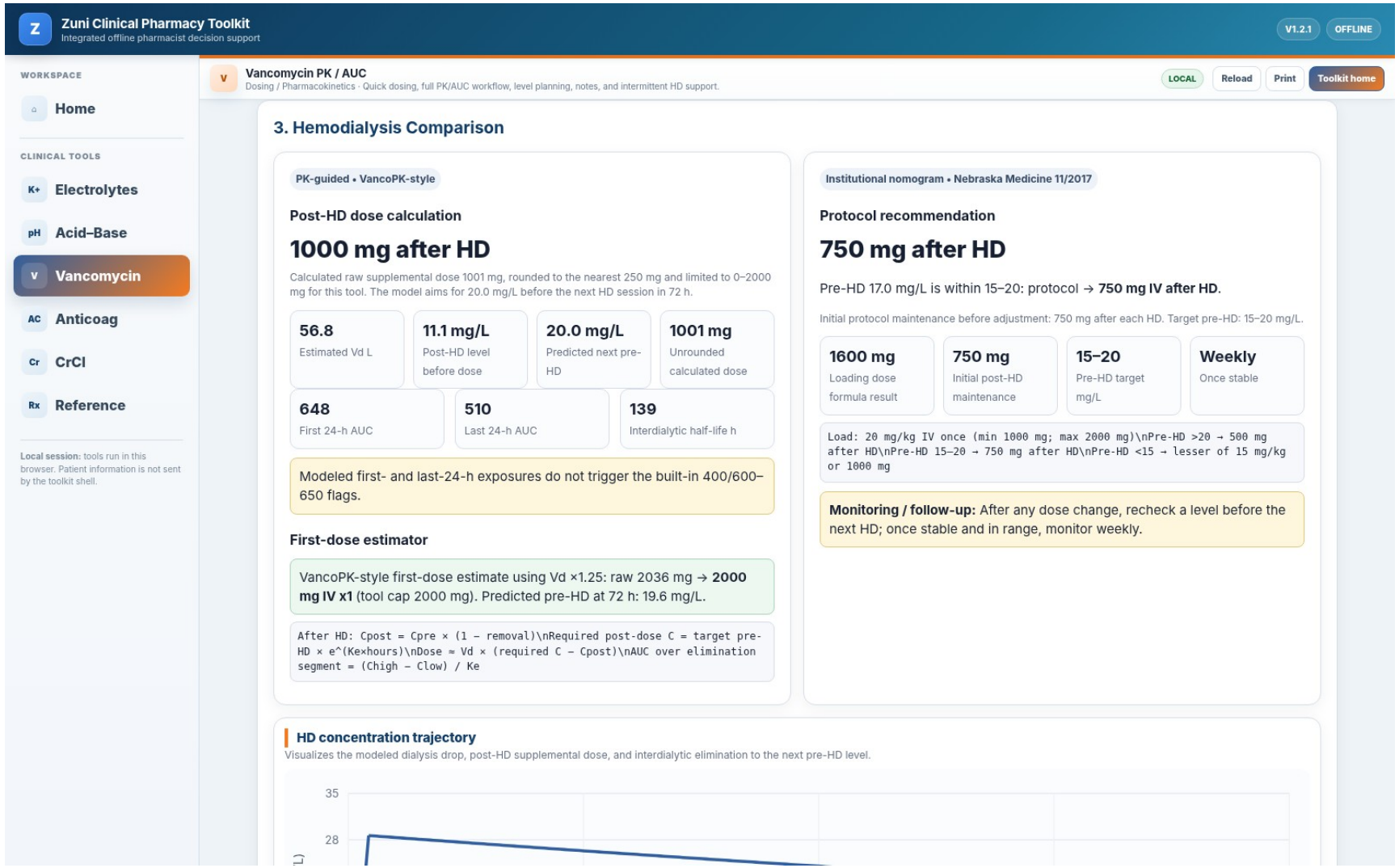
3 Blue decay

The concentration then falls using the entered interdialytic Ke until the next session.

4 Green endpoint

The next pre-HD concentration is the practical monitoring endpoint used to judge the post-HD dose.

A 72-hour weekend interval can require a different post-HD dose



1 Change only the interval

The patient and pre-HD level are unchanged; time to next dialysis is now 72 hours.

2 PK dose increases

The modeled supplemental dose rises to 1000 mg after HD to target the next pre-HD concentration.

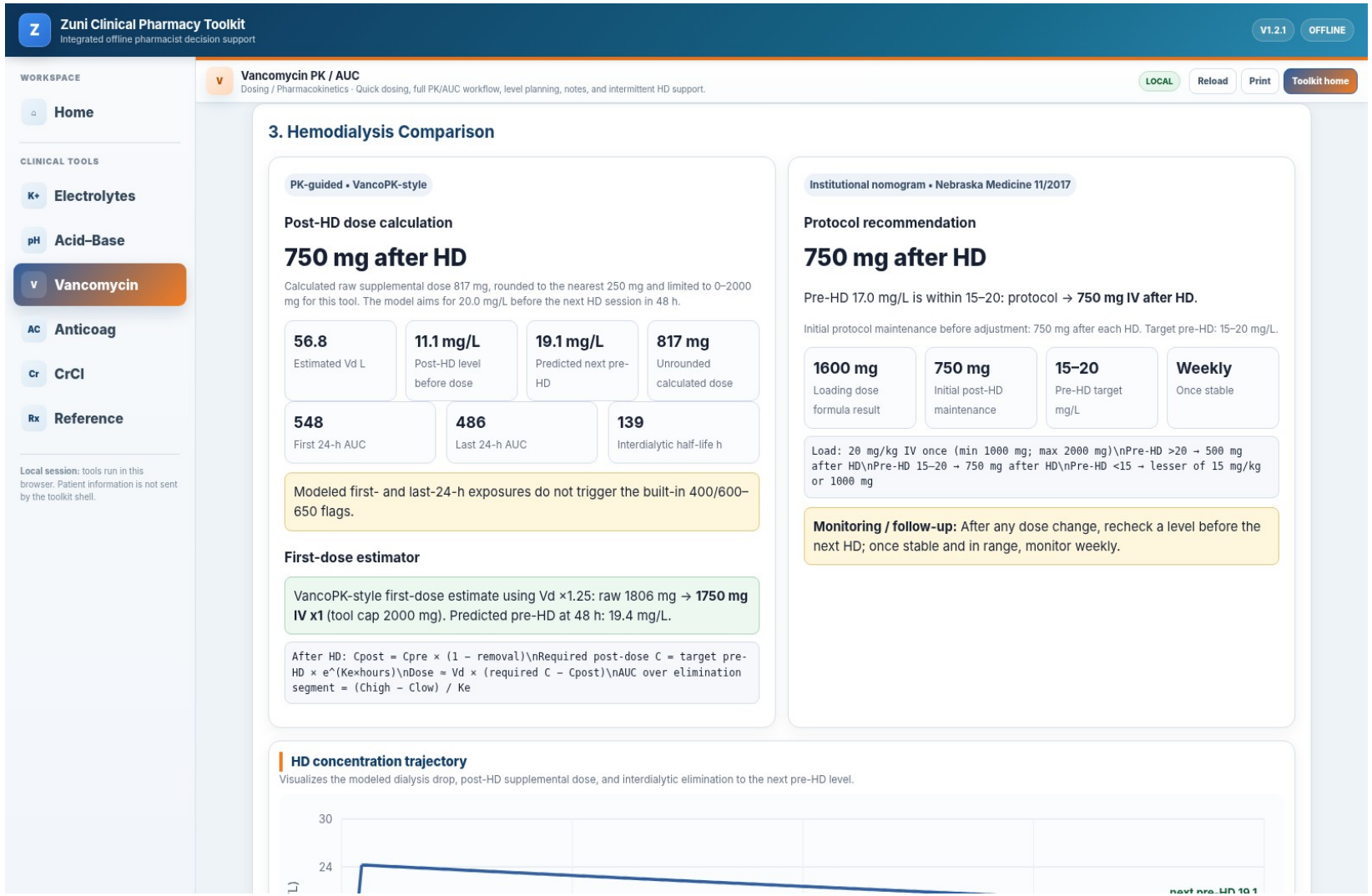
3 Why?

There is another day of interdialytic elimination before the next session, so more post-HD drug is required in this model.

4 Do not reuse the 48-hour answer

Always select the actual next-HD interval; M/W/F schedules contain both 48- and 72-hour gaps.

Treat the built-in first-dose estimator as an approximation, not a universal loading protocol



1 What the estimator does

It uses a VancoPK-style first-dose Vd that is 25% larger and works backward from the selected pre-HD target.

2 It can differ from guideline loading doses

For this case the tool estimates 1750 mg, while current consensus guidance uses weight-based loading recommendations for high-flux HD.

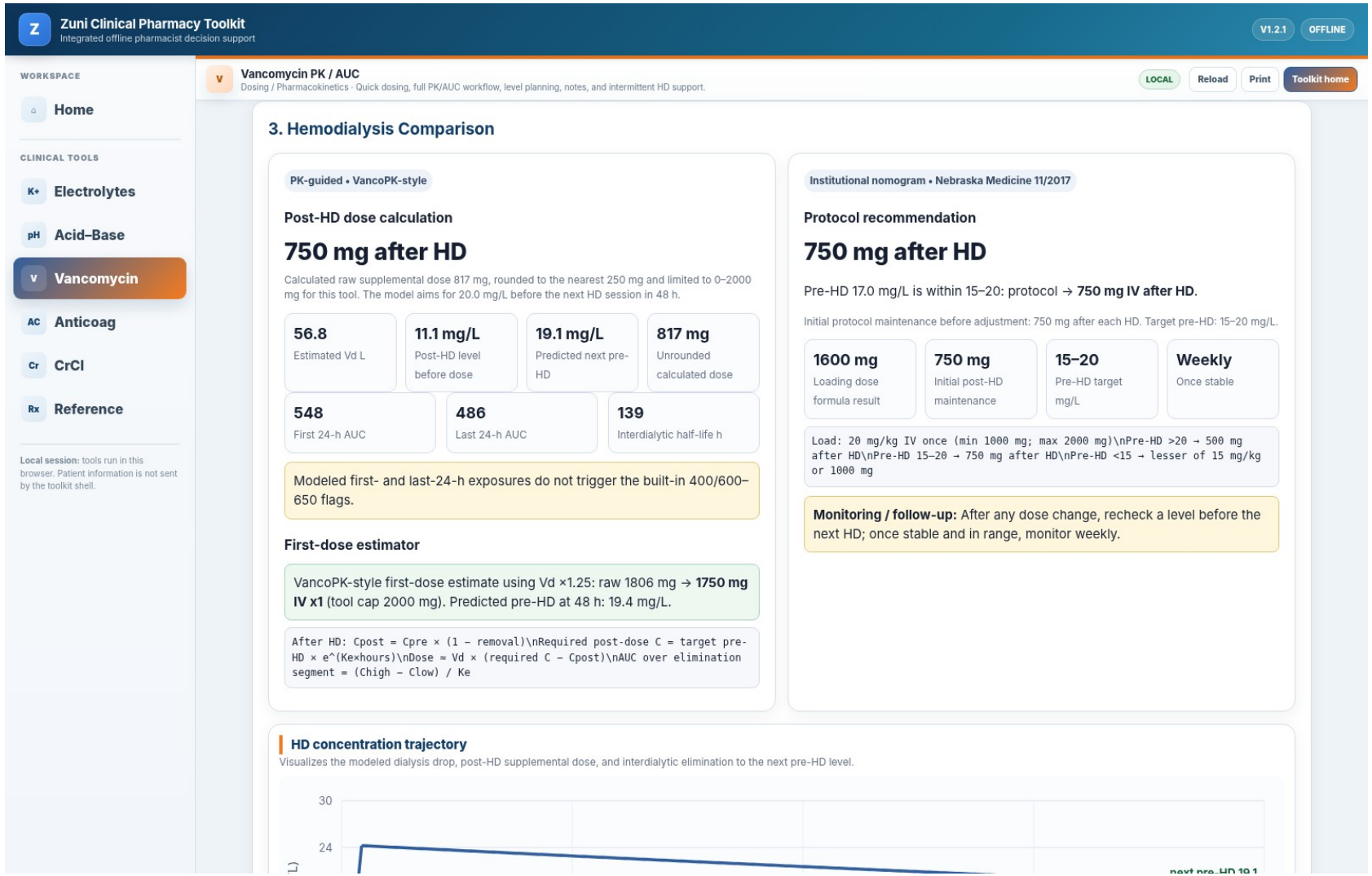
3 Current guideline starting point

For vancomycin given after high-flux HD, the 2020 consensus table lists a 25 mg/kg loading dose and 10 mg/kg maintenance dose as initial weight-based recommendations, followed by concentration-guided adjustment.

4 Use institutional policy

The estimator is decision support. Follow the loading strategy required by the site/protocol managing the patient.

Understand what the Nebraska comparison is — and what it is not



1 — Legacy institutional nomogram

The right-hand box reproduces the supplied Nebraska Medicine protocol updated 11/2017.

2 — Simple level bands

In the tool: >20 → 500 mg after HD; 15–20 → 750 mg; <15 → lesser of 15 mg/kg or 1000 mg.

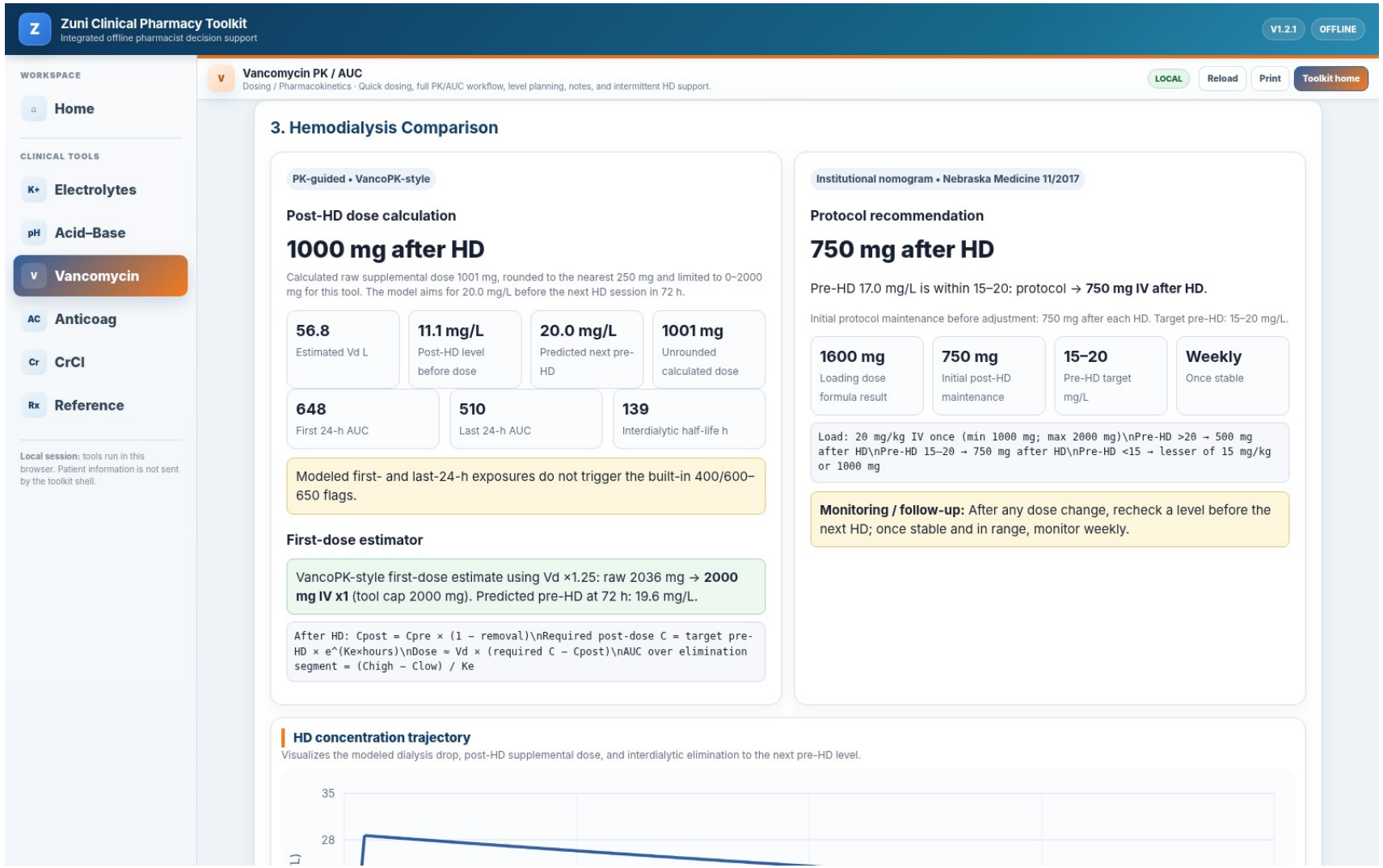
3 — It is intentionally different

Unlike the PK side, this nomogram does not explicitly calculate Vd, dialysis removal, Ke, or the 24/48/72/96-hour interval.

4 — Do not treat it as current consensus

Use it only if your institution specifically follows that pathway; current consensus emphasizes weight-based starting doses plus pre-HD concentration-guided individualization.

When the two boxes disagree, the disagreement is information — not an error



1 — PK side: 1000 mg

The 72-hour interval is explicitly part of the PK calculation.

2 — Legacy side: 750 mg

The Nebraska band still sees a 17 mg/L pre-HD level and assigns its 15–20 mg/L dose.

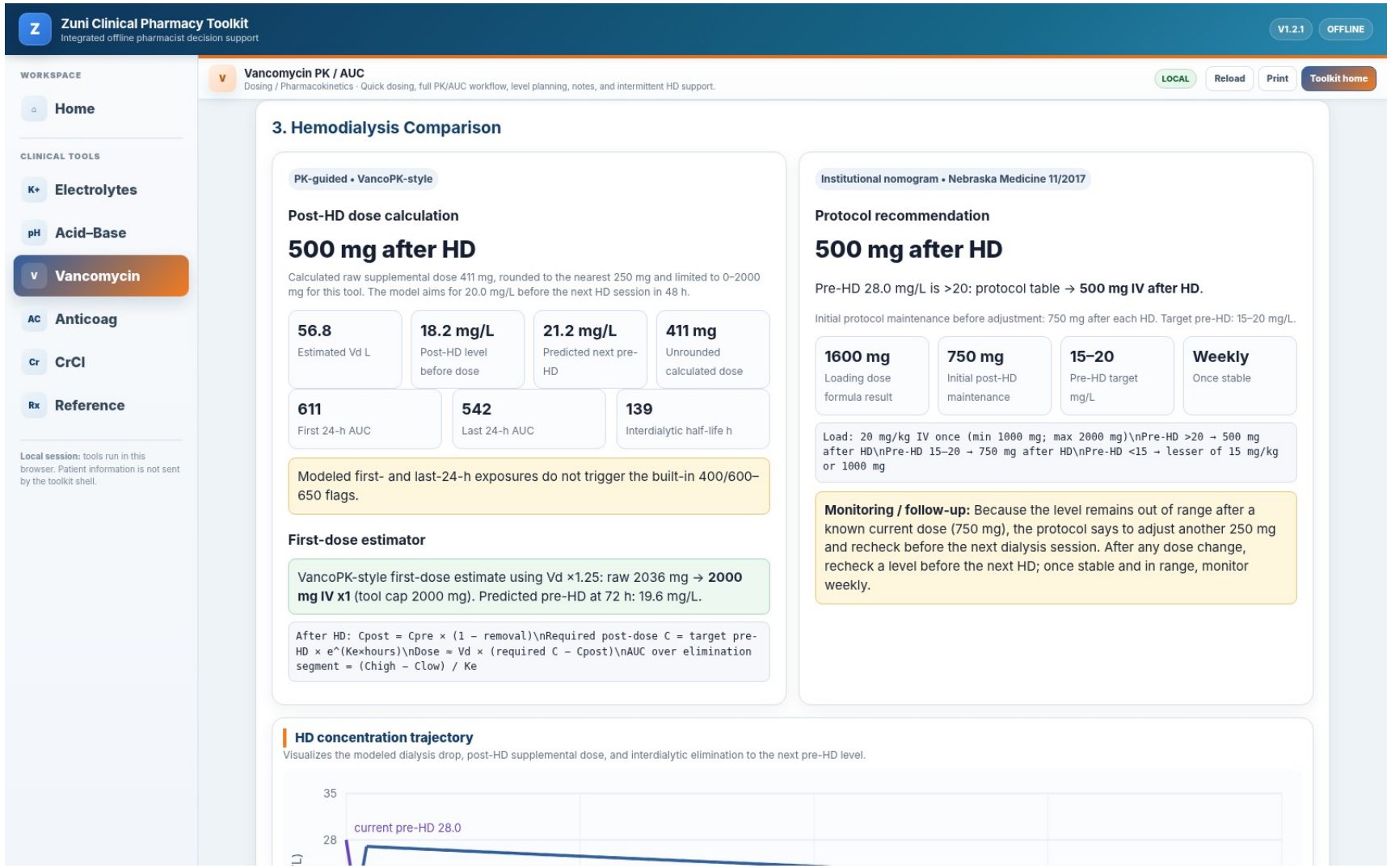
3 — Why they diverge

They answer the dosing question using different assumptions and different levels of model detail.

4 — Resolve with policy + patient context

The calculator itself instructs the user to follow the pathway required by the institution.

High pre-HD concentrations can lead to a small dose or a hold



1 — Training level = 28 mg/L

After modeled 35% dialysis removal, substantial vancomycin remains.

2 — PK side calculates 500 mg

The model only supplements what is needed to approach the next pre-HD target.

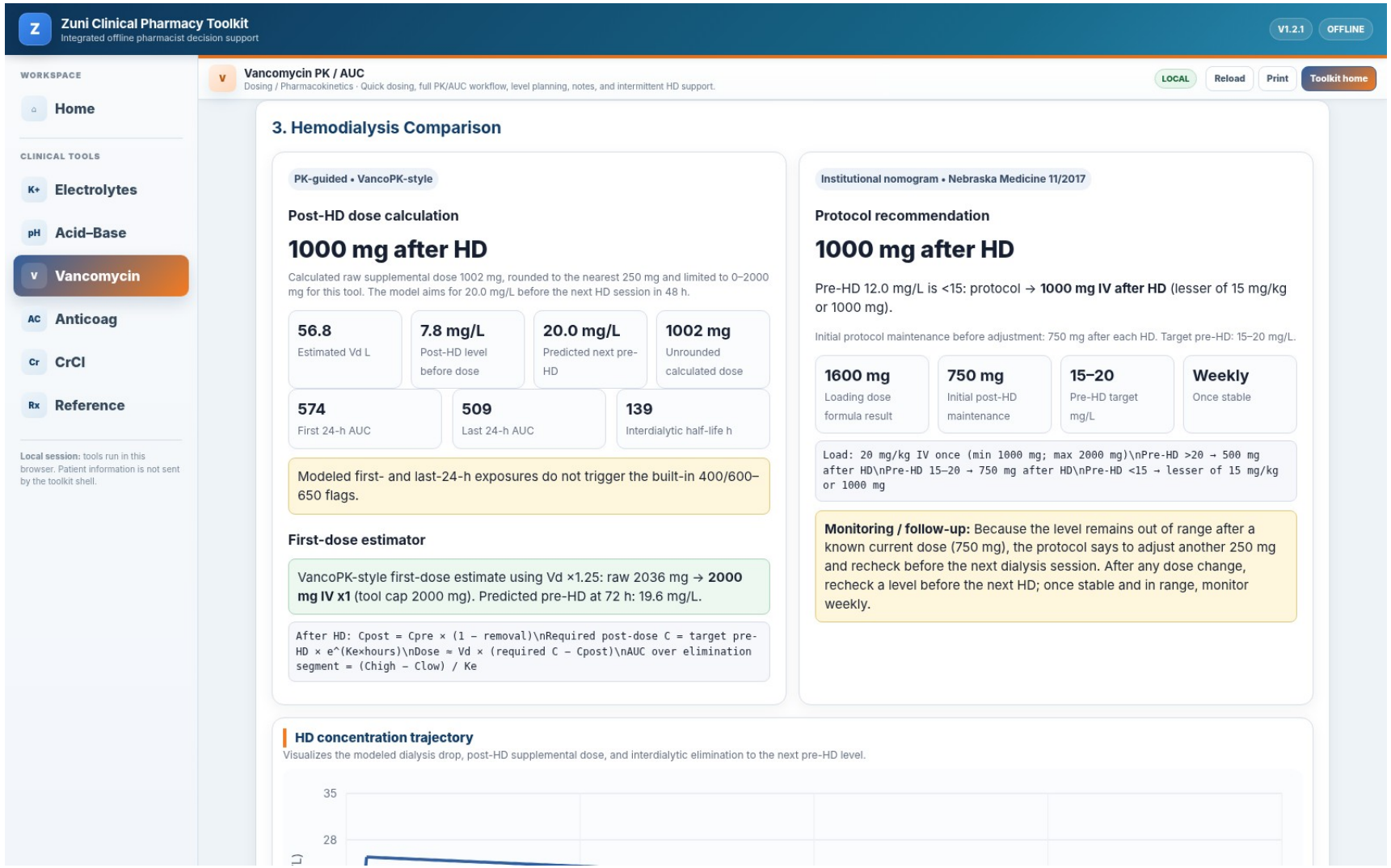
3 — Legacy protocol also shows 500 mg

Its >20 mg/L band assigns 500 mg; the tool notes that very high levels may sometimes require skipping a dose under that legacy protocol.

4 — Verify before dosing

Unexpectedly high concentrations should trigger a check of level timing, dose history, dialysis session, and institutional hold criteria.

Low pre-HD concentrations generally require more replacement



1. **Training level = 12 mg/L**
   The starting concentration is below the usual 15–20 mg/L pre-HD target range.

2. **PK side: 1000 mg**
   With 48 hours to the next HD session, the model calculates enough post-HD drug to predict about 20 mg/L next time.

3. **Legacy side: 1000 mg**
   For <15 mg/L, the supplied protocol uses the lesser of 15 mg/kg or 1000 mg.

4. **Recheck after changes**
   The legacy box recommends another level before the next HD after a dose adjustment; current guidance also emphasizes concentration-guided individualization.

HD workflow: keep the sequence simple and repeatable

1

1. Confirm the modality

Stable intermittent high-flux HD only. Do not use this pathway for SLED, CRRT, or PD.

2

2. Obtain the pre-HD level

Use a concentration drawn immediately before dialysis when following the intended workflow.

3

3. Enter the actual next-HD interval

24, 48, 72, or 96 hours materially changes the PK-guided dose.

4

4. Review assumptions

Check dialysis removal, interdialytic Ke, target, and any known current post-HD dose.

5

5. Compare and interpret

Read the PK-guided calculation and the legacy nomogram as separate strategies rather than averaging them together.

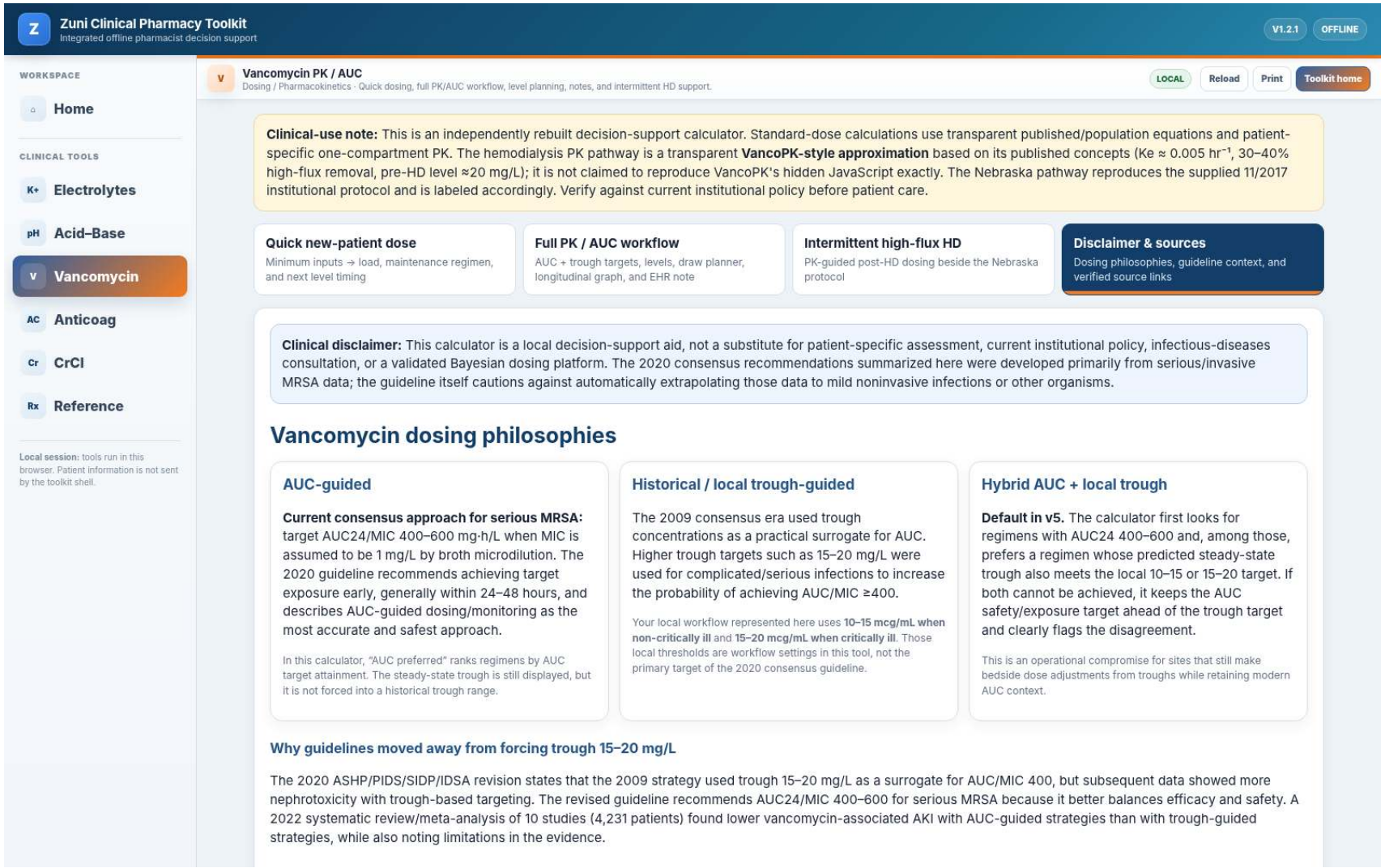
6

6. Dose, monitor, repeat

Use institutional policy, administer the selected post-HD dose, and let the next pre-HD concentration drive subsequent dosing.

Current consensus: pre-HD 15–20 mg/L is the practical monitoring range most likely to correspond to AUC24 400–600 when MIC ≤1 mg/L.

Use Disclaimer & Sources to understand the tool's dosing philosophy



1 — Decision support

The calculator explicitly states that it is not a substitute for patient-specific assessment, current institutional policy, or specialist input.

2 — HD evidence is different

The 2020 consensus acknowledges limited HD outcome data and recommends practical pre-HD concentration monitoring rather than pretending HD AUC estimation is as

3 — Know which pathway you are using

The PK-guided HD side is a transparent approximation; the Nebraska side is a reproduced 2017 institutional protocol.

4 — Next: Chapter 6

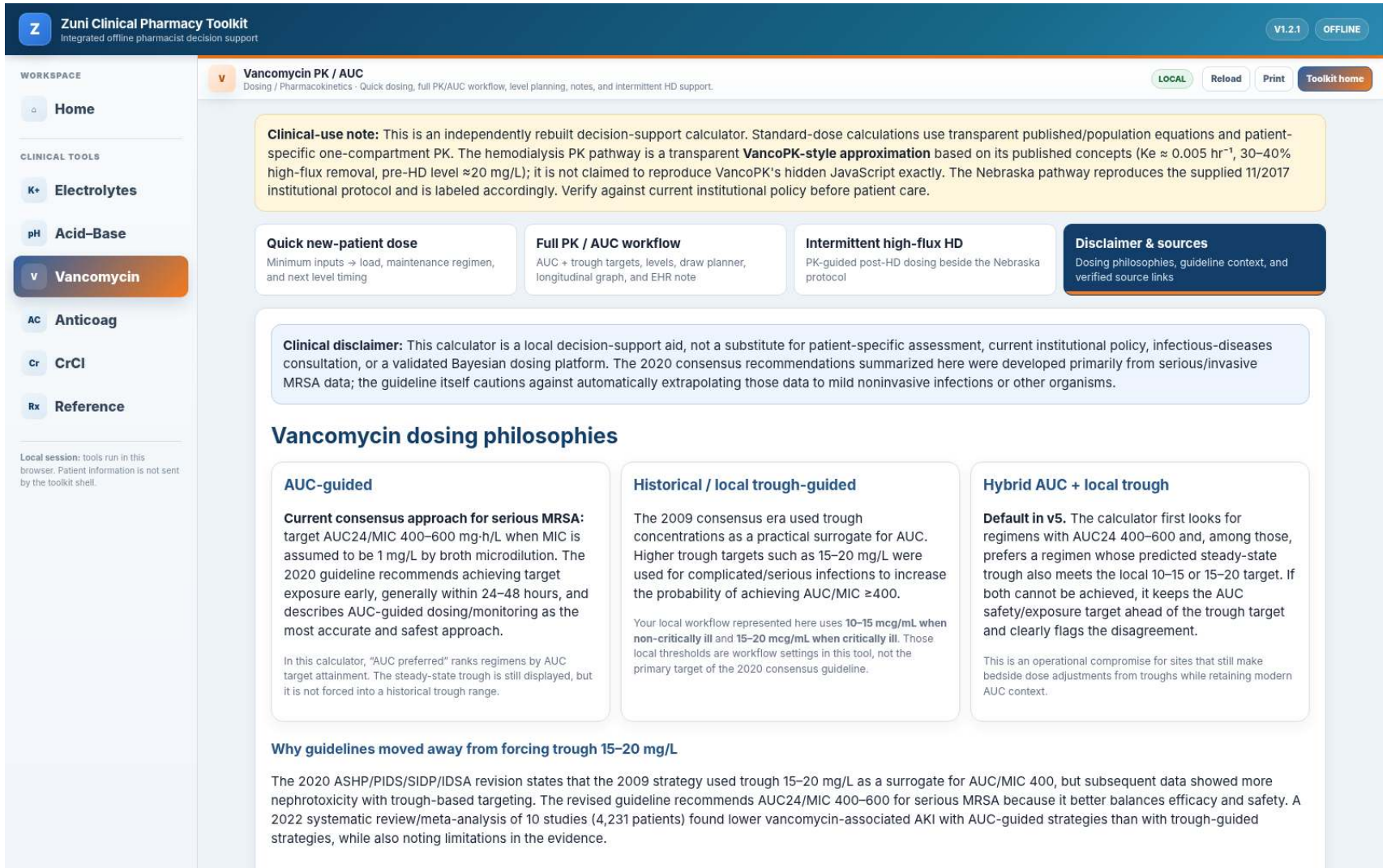
Finish the tutorial with dosing philosophy, safety limitations, sources, and the complete ZSURx vancomycin workflow.

Vancomycin PK / AUC

Chapter 6 — Philosophy, Safety, Sources & Complete Workflow

The capstone: understand what the calculator is designed to do, where its limits are, and how the six chapters fit into one pharmacist workflow.

Start with the tool's dosing philosophy



1 AUC is the primary modern framework

For serious/invasive MRSA, the tool presents AUC24 400–600 mg·h/L when MIC is assumed 1 mg/L as the primary exposure target.

2 Trough targets remain visible

Local/historical trough ranges are retained because they may still appear in site workflows, but they are not presented as the primary 2020 consensus target.

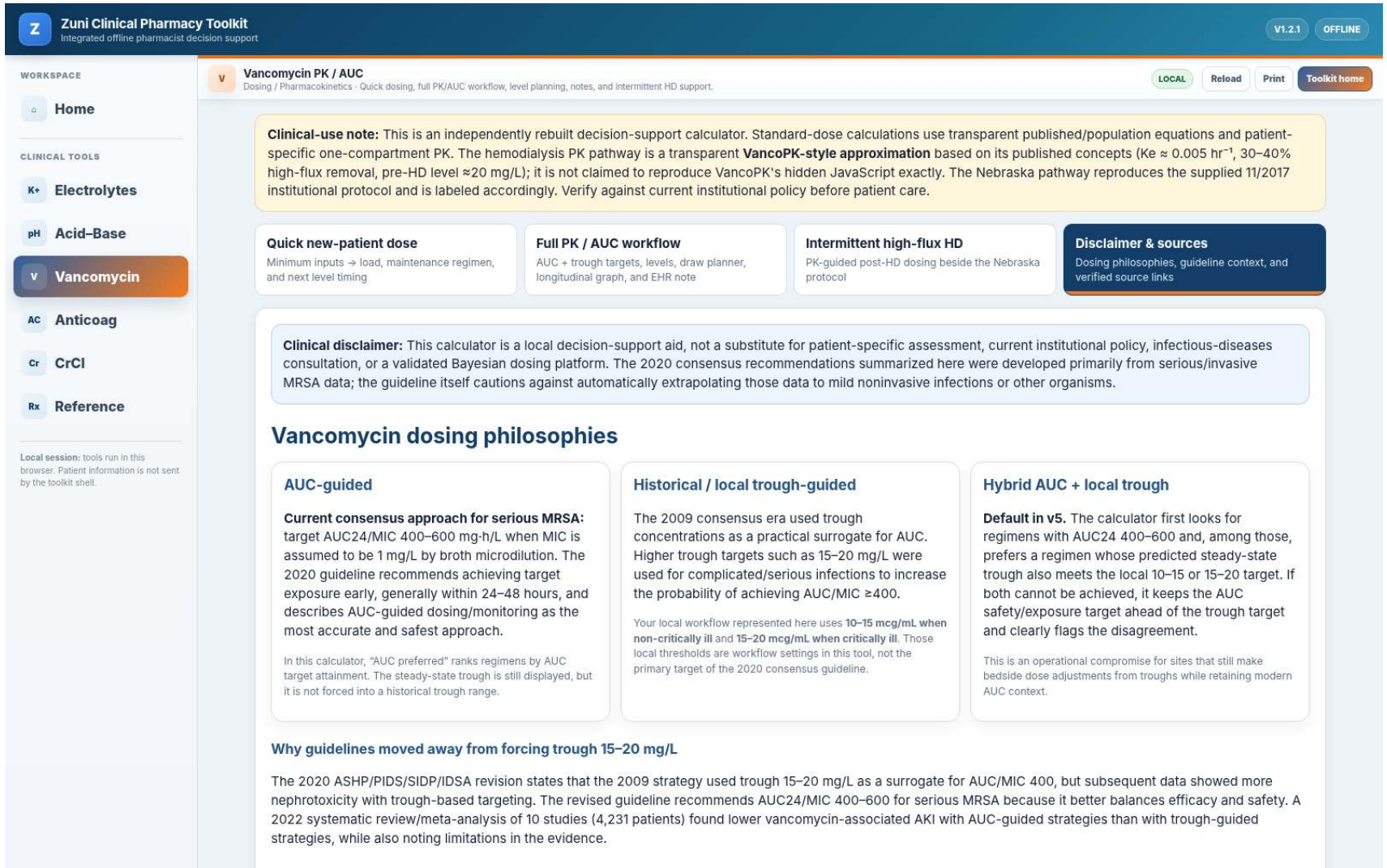
3 Hybrid mode

AUC + local trough first seeks the AUC target, then prefers a regimen that also fits the selected local trough range when possible.

4 Know the population

The guideline evidence is centered on serious MRSA infection; do not automatically generalize every target to every indication.

Use Disclaimer & Sources when you need to verify where a rule came from



1 — Consensus guideline

The source list includes the 2020 ASHP/IDSA/PIDS/SIDP vancomycin monitoring guideline and its published summary.

2 — Historical context

The older 2009 trough-era guideline is retained so users can understand why 15–20 mg/L trough targeting appears in legacy practice.

3 — Safety evidence

The source list also includes evidence comparing AUC-guided versus trough-guided monitoring and AKI risk.

4 — HD sources are labeled separately

The HD approximation and reproduced Nebraska protocol are identified as different methods rather than blended into one evidence source.

Know what this calculator is — and what it is not

1 Transparent decision support

The calculator exposes equations, PK source, timing assumptions, and modeled concentrations so the pharmacist can audit the result.

2 Not a Bayesian platform

One-level fitting, two-level first-order PK, and longitudinal trough fitting are non-Bayesian methods. Do not describe their output as Bayesian AUC.

3 Not a replacement for the clinical record

The model only knows the dose history, labs, levels, and times entered into it. MAR errors or missing doses can invalidate the result.

4 Not an autonomous order

A calculated regimen is a modeled option. Indication, cultures, renal trend, toxicity, access, administration feasibility, and policy remain pharmacist/clinical decisions.

5 Not every patient fits one-compartment PK

Rapidly changing renal function, unusual volumes of distribution, unstable critical illness, and extracorporeal therapies can reduce model reliability.

6 HD is its own branch

Use the dedicated stable intermittent high-flux HD workflow rather than forcing dialysis patients through the standard CrCl maintenance model.

The complete non-HD workflow: from first dose to follow-up

1 **Quick Dose** — Chapter 1
Get a rapid starting load + maintenance plan.

2 **Full PK / AUC** — Chapter 2
Verify patient, renal, PK model, targets, and candidate regimens.

3 **Plan levels** — Chapter 2
Build the actual dose timeline and choose a valid draw time.

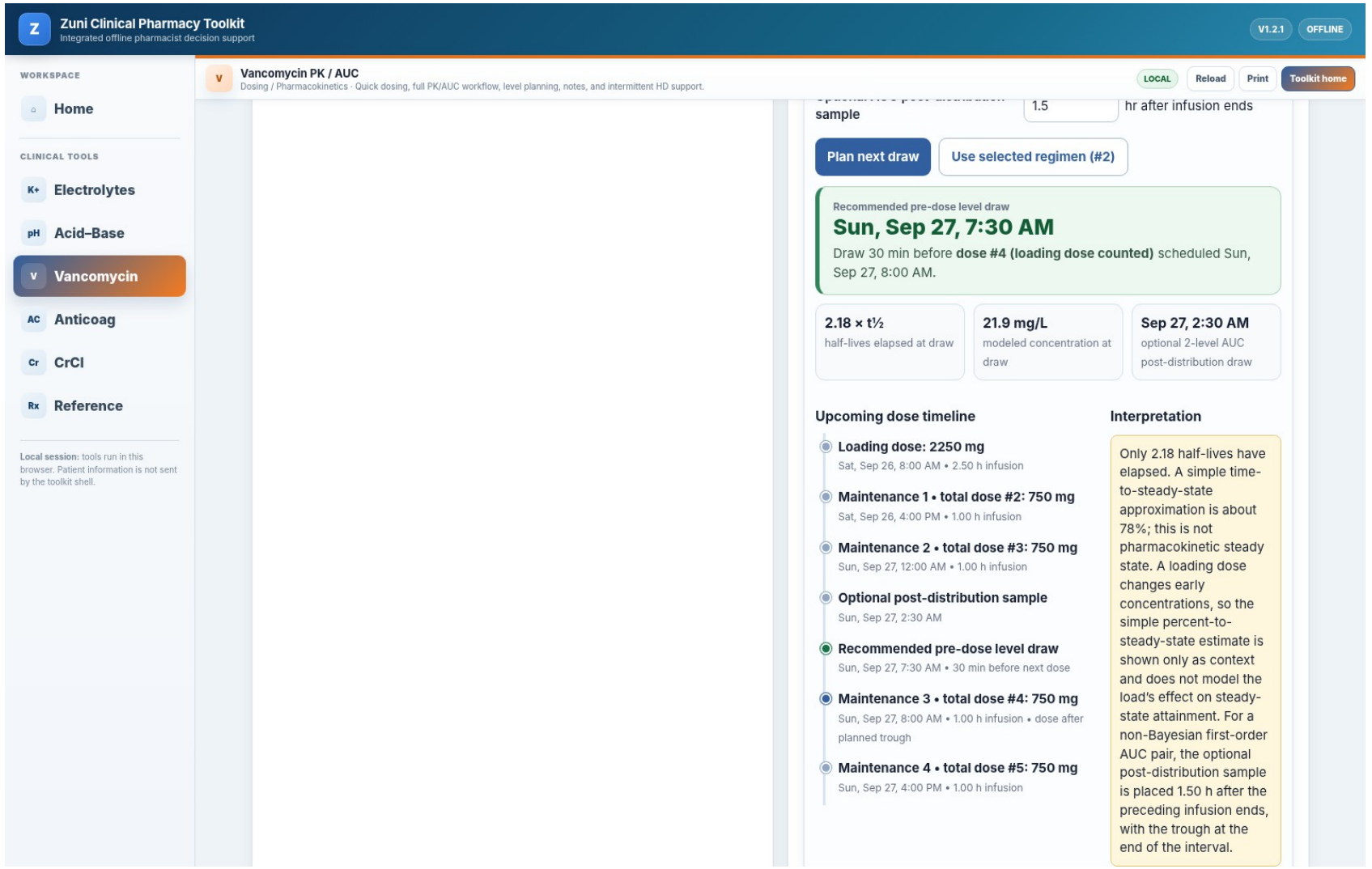
4 **Measured PK** — Chapter 3
Enter one or two timed concentrations and update PK.

5 **Reassess exposure** — Chapter 3
Compare AUC, peak, trough, graph, and alternatives using the updated PK.

6 **Regimen change** — Chapter 4
Join the actual old course to a prospective new regimen and plan the next level.

At every step, keep actual administration history separate from prospective recommendations.

The most important safety feature is accurate timing



1 — Dose start time

The calculator needs the time the infusion actually started — not merely the scheduled administration time.

2 — Infusion duration

Peak/post-distribution interpretation depends on when the infusion ended.

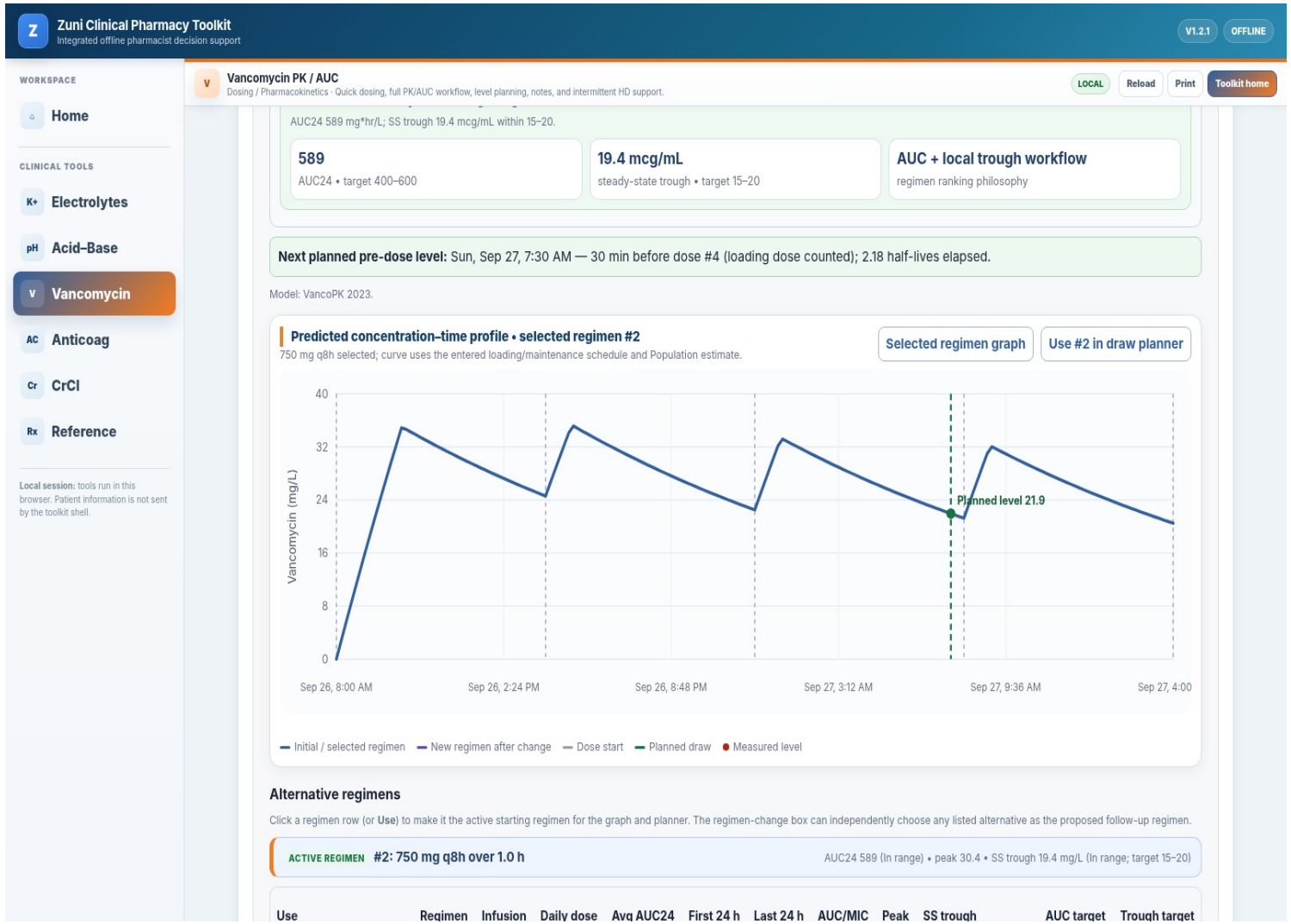
3 — Sample collection time

A level without an accurate collection time can produce a misleading Ke, Vd, clearance, AUC, or trough estimate.

4 — Missing or delayed doses

Update the timeline when the real course differs from the intended schedule before fitting measured concentrations.

Always identify whether a number is measured, modeled early-course, or steady-state



1 — Measured concentration

A laboratory result entered by the user. Its value and timestamp are observed data.

2 — Predicted level at planned draw

A model-derived concentration at a specific future/early-course time using the entered dose history.

3 — Steady-state peak / trough

Model-derived concentrations for repeated maintenance dosing after accumulation. They may differ from early-course values.

4 — AUC24

A modeled 24-hour exposure based on the current PK source and selected maintenance regimen.

Watch the PK source as the quality of patient-specific information changes

1 **Population PK**

Initial estimates use the selected published/population clearance and Vd equations.

2 **One-level fit**

A single post-distribution concentration can update Ke while Vd remains fixed to the selected model.

3 **Two-level first-order PK**

Two appropriately timed concentrations can estimate Ke and Vd using the tool's Sawchuk-Zaske workflow.

4 **Longitudinal trough fit**

A new trough can fit Ke against the entered full dose history while Vd remains fixed — but do not reuse a level already incorporated into the PK.

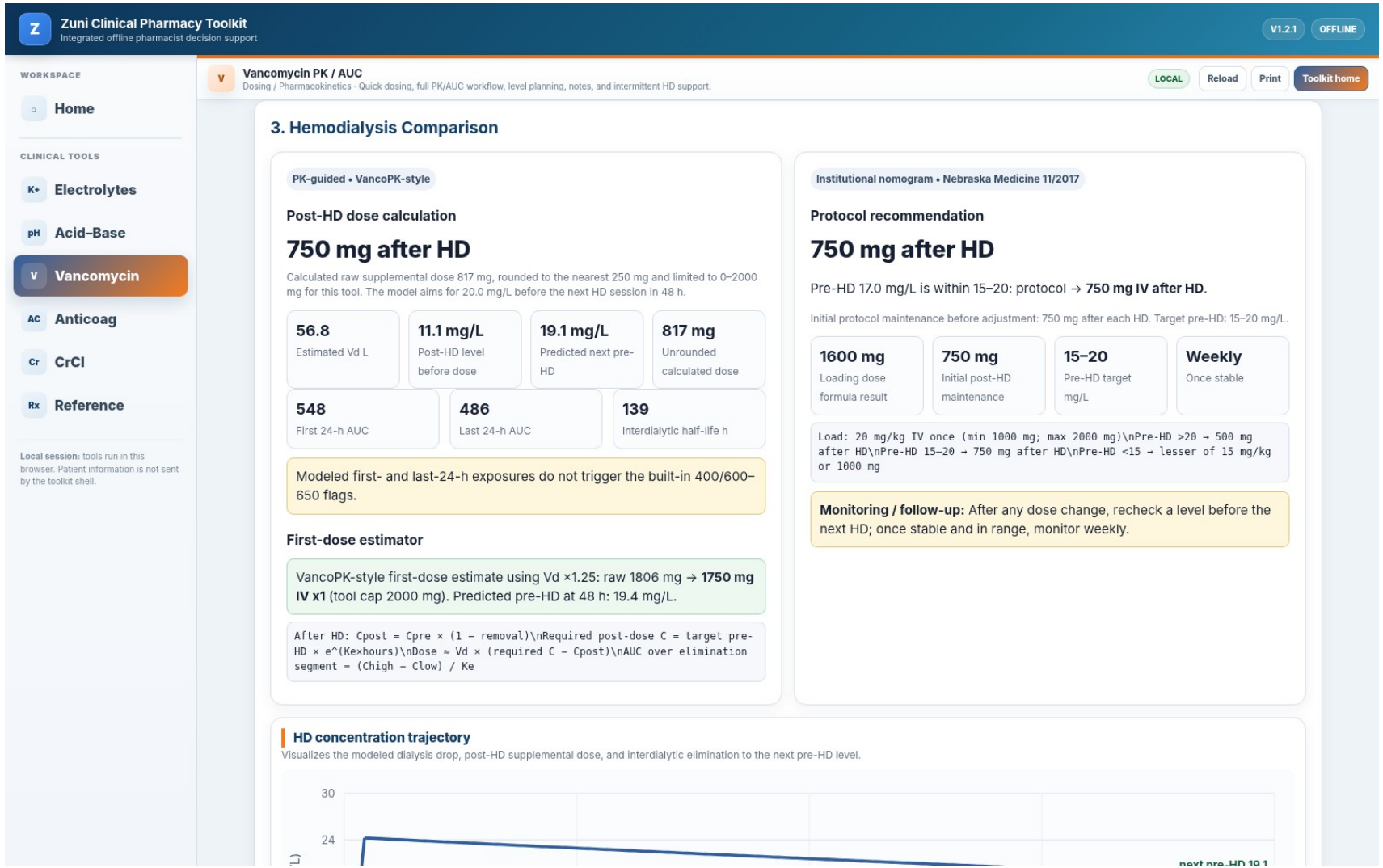
5 **The source label matters**

Before acting on a recommendation, know whether it is population-predicted or derived from measured patient concentrations.

6 **More data is not automatically better**

Incorrectly timed or duplicated levels can make a patient-specific model worse than a transparent population estimate.

Dialysis patients branch into a different workflow



1. **Stable intermittent high-flux HD**
   Use the dedicated HD mode for its intended modality; SLED, CRRT, and PD are excluded.

2. **Pre-HD concentration drives adjustment**
   The practical workflow is pre-HD level → modeled dialysis removal → post-HD dose → next pre-HD prediction.

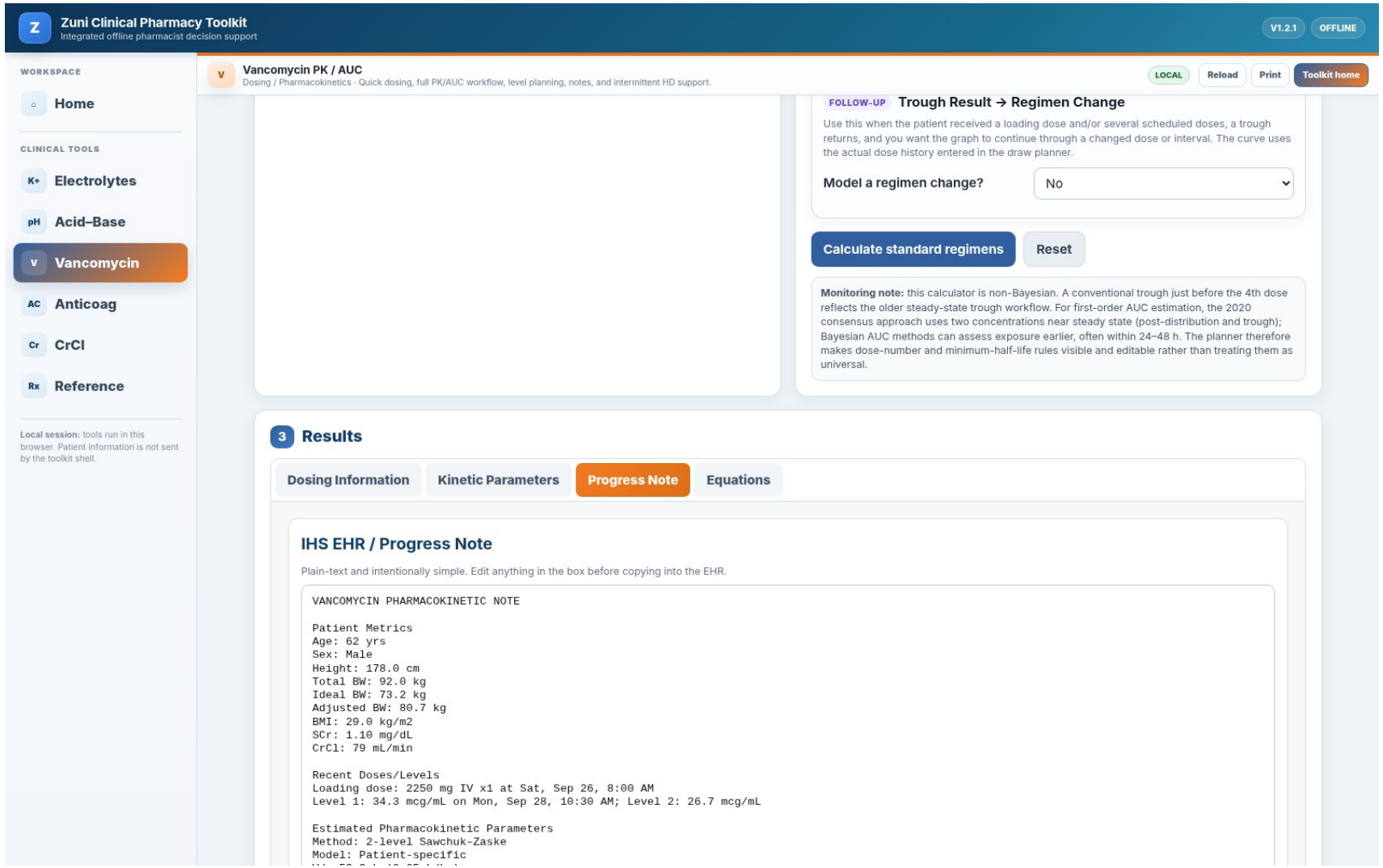
3. **Interval is part of the dose**
   24/48/72/96-hour time to next HD materially changes the PK-guided recommendation.

4. **Do not average strategies**
   The PK-guided approximation and legacy Nebraska nomogram are separate pathways; follow the institutional approach in use.

Before you act on a vancomycin recommendation, run this final check

- ✓ **Patient**
  Correct age, sex, weight, height, renal status, dialysis modality?
- ✓ **Course**
  Do entered dose starts and infusion durations match the MAR?
- ✓ **Level**
  Was the concentration drawn when the calculator thinks it was?
- ✓ **PK source**
  Population estimate, one-level fit, two-level PK, or longitudinal trough fit?
- ✓ **Target**
  AUC strategy, local trough strategy, hybrid, or HD pre-level target?
- ✓ **Recommendation**
  Is this an administered regimen, an active model, or a prospective candidate?
- ✓ **Monitoring**
  Is the next draw timed to the actual future regimen?
- ✓ **Clinical context**
  Does the plan fit indication, renal trend, toxicity risk, cultures, response, and site policy?

Finish by documenting the story the calculator actually modeled



1 Refresh after the final calculation

The Progress Note should reflect the final PK source, regimen, measured levels, and monitoring plan.

2 Read it before copying

Generated text is editable. Correct anything that does not match the MAR, laboratory record, indication, or clinical plan.

3 Preserve the reasoning

A useful note makes clear what was observed, what was calculated, what regimen is proposed, and when the next level is due.

4 The calculator supports the note

It does not replace pharmacist assessment or the institution's documentation requirements.

ZSURx Vancomycin Workflow — Complete

Six chapters • one continuous pharmacist workflow

1 Quick Dose — Rapid initial plan

2 Full PK/AUC — Initial dosing + monitoring plan

3 Levels & Patient PK — Measured concentrations

4 Longitudinal Course — Regimen adjustment

5 High-Flux HD — Separate dialysis pathway

6 Safety & Sources — Interpretation + guardrails

Use the calculator to make the pharmacokinetic reasoning visible — then verify the data and make the clinical decision.