

Renalware® Features & Specifications

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User Functions & Dashboard

- Account Registration
- Update Profile/Password
- Retrieve Forgotten Password
- User Letters
- User Messages
- Manage Snippets
- Patient Bookmarks
- Electronic CCs

Superuser Functions

- Manage Event Types
- Manage Drug List
- Manage Modality Types
- Configure PD Bags
- Manage Primary Care Physicians
- Empty System Caches
- Run File Imports
- View Feedback
- Schedule login screen alerts/notifications
- Superuser record deletion
- Manage “hidden users”
- Configure Nags
- Manage Vaccination Types
- Track UKRDC Activity
- Outgoing Documents Listing
- Letter Descriptions management
- Clinic add/edit/(soft) delete functions
- Reports menu (*See Appendix 2*)

Administrator Functions

- Manage Users (Set roles)
- Manage Hospital Units/HD Sites
- Manage Cannulation Types
- Manage HD Dialysers
- Request Form Print History
- View Pathology Request Form Algorithm
- Edit Email Templates
- Manage Vaccination Types
- Create and edit Event Types

System Functions

- Snippets for insertion into Letters, Events
- Global Directory of People & Addresses (for Letters, Contacts)
- Internal Messaging system
- Quick Search (by full or partial name, hospital number, NHS number)

Patients Lists & Functions

- Patients List
- Add Patient (Manual entry)
- Deceased Patients
- “Worryboard”
- Admission Requests (“TCI”)
- Admission Consults
- Admission Inpatients

Renal Lists & Functions

- Appointments
- Clinic Visits
- Transplant Wait List
- Live Donors List
- Ongoing HD Sessions
- HD Patients with un-met preferences
- Letters List with filters
- ESA Patients
- Audits
- AKI Alerts (*site HL7 feed dependent*)
- Clinical Studies
- Renal Registry Checks (“pre-flight”)

MDM Lists & Screens

For Multidisciplinary Meetings

- HD
- PD
- Transplant
- AKCC (formerly Low Clearance)

Clinical Studies

- Manage study lists
- Add/Remove patients to studies
- Display study status on patient screens

Internal Messaging

- Send message to other user(s) regarding a given patient
- View historical messages (Inbox/Read/Sent)
- Filter message history by patient
- Check message status (read/unread)
- View messages on dashboard

Letters Module

- Create, Review, Archive letter workflow
- Simple, Clinical, and Clinic Visit letter formats
- Insert snippets into letters
- Simplified recipient and CC selection via Patient Contacts
- RTF text formatting in body of letter
- Add electronic CCs to other Renalware users
- View DRAFT and PENDING REVIEW letters on user dashboard
- Download or Print PDF version
- Batch printing of letters
- QR code links to online articles in letters
- Systems Integration e.g. to Transfer of Care, GPs, EPR (*site dependent; see Appendix 2*)

Patient Functions: General

CLINICAL SUMMARY

- Problems List
- Current Prescriptions
- Recent Letters
- Recent Events
- Recent Admissions
- Recent Consults

DEMOGRAPHICS

- View and Edit
- Update GP & Referral Info
- Enter date and cause of death
- Change Letter CC preferences
- Change Renal Registry preferences
- Change Renal Patient View preferences
- Psychosocial data

CONTACTS

- View and add contacts from Directory
- Assign Contact Type
- Contacts used as Recipients & CCs in letters
- Contact Types are configured at system level

PROBLEMS

- Enter, Edit and Archive Problems
- SNOMED code selection (searchable)
- Attach one or more Notes to a given Problem
- Drag-and-drop sorting of Problems List
- Display of Archived Problems

CLINICAL & RENAL PROFILES

- Record Allergies with date
- Smoking, Diabetes and Alcohol Histories
- MRSA/MSSA Swab logs
- ESRF info entry and display
- Primary Renal Diagnosis (PRD)
- Display historic EDTA Diagnosis
- Renal Registry/UKRDC Comorbidities
- Low Clearance Profile
- Body Composition Records
- Iron Dose History
- Psychosocial History
- Address at ESRF Date (for Renal Registry)

MODALITY HISTORY

- Track start and end date of Modalities
- Renal Reg "reason for change" for HD/PD
- "Death" Modality entry prompts Cause of Death entry (EDTA codes)

PATHOLOGY

- Historical results (selected pathology tests)
- Historical results (detailed)
- Custom pathology views
- Current (latest) pathology results display
- Complete investigations list
- Historical display of a given result
- Required Pathology Tests
- New Patient Rule (generate requests)
- Results charting (1m, 3m, 1y, 3y, 10y)

PRESCRIPTIONS

- Add and terminate prescriptions
- Filter drugs by drug type (on adding and displaying)
- Current and Historical prescriptions lists
- "Give on HD" option in prescription form
- Print "Home Delivery Form" option
- DM+D (Dictionary of medicines and devices) drug selection (lists auto-updated weekly)

CLINIC VISITS

- Enter clinic visit and observations
- Insert Snippet option for Notes field
- Create Clinic Visit Letter option for given visit
- Display Clinic Visits without letters

VIROLOGY & VACCINATION

- Vaccination Entry and History
- Virology Profile
- Covid-19 status

Patient Functions: Renal

ACCESS SUMMARY

- Enter current Access Profile
- View Profile History
- Access Plan Recording
- Access Procedures History
- Access Assessment History
- 'Ease of Assessment (MAGIC)' needling assessments

PD SUMMARY

- Current PD Regime
- Automated calculation fluid volumes including Weak/Medium/Strong bags
- CAPD/APD Regimes History
- Peritonitis Episodes
- Exit Site Infections
- PET/Adequacies
- PD Training Session

HD SUMMARY

- HD Profile
- Print HD Session Form
- Access Profile
- Patient HD Preferences (site and schedule)
- Dry Weight logging
- Enter HD Session (or DNA Session)
- List Recent Sessions or View All
- HD Audit (available in HD MDM screen)
- HD Scheduling module (assign HD stations)

TRANSPLANT RECIPIENT SUMMARY

- Recipient Workup
- Transplant Waiting List Registration
- Recipient Operations
- Renalware transplant status/Tissue Typing status mismatch detection

TRANSPLANT DONOR SUMMARY

- Donor Summary
- Assignment of recipient(s) to donor
- Donor Workup
- Donor Operations
- Investigation logs

PATIENT-RECORDED OUTCOME MEASURES (PROMS)

- EQ5D Questionnaire entry and history
- POS-S Questionnaire entry and history

COMPLEX CHARTS/ANAEMIA

- HGB, Ferritin, CRP charts
- ESA Prescription History
- Iron Clinic Events
- Bone Profile
- Bone/Anemia charts

ADVANCED KIDNEY CARE (AKC)

- Clinical Frailty Score (CFS) Entry
- CFS History
- CFS “Nags” when missing
- Advanced Care Plans Entry/History

Events

Renalware’s Events module is one of the most powerful and flexible features of the application, enabling an enormous variety of information to be entered via simple or highly-structured forms. The simple or “general” event forms have Event Type, Date, and free text Notes fields (as well as logging user and timestamp data). Complex event forms use JSON fields to capture virtually any kind of information, thus enabling long form data entry and context-specific dropdown menus or other select options. There is also an option to insert user-defined “snippets” into text fields.

Events may be created and edited by administrators and there is an option to convert any given event into a PDF at the time of entry and sent to the hospital’s EPR system (*requires systems integration*).

COMPLEX EVENT TYPES

Examples of complex event types include the following:

- Renal Biopsy Transplant
- Investigation
- Clinical Frailty Score
- Medication Review
- Transplant Review
- Dental Study
- Foot Study
- Advanced Care Plan
- Swab
- Renal Biopsy Native
- Vaccination

GENERAL EVENT TYPES

Examples of general event types are listed in *Appendix 1*. (Renalware includes a standard set and each hospital administrator can create additional ones.)

Additional Functionality

LETTER LISTS

- DRAFT: Toggle, Preview, Edit
- PENDING REVIEW: Toggle, Preview, Edit
- ARCHIVED: Toggle or View (HTML, PDF)
- Print Queue with filters and Print All option

BOOKMARK & ALERT OPTIONS

- Add/Remove from User bookmarks
- Mark bookmark as 'Routine' or 'URGENT'
- Add/Remove from global "Worry Board"
- Add patient "Alerts" (multiple permitted)

CLINICAL RESEARCH

- Patient participation in research studies displayed on Clinical Summary screen

ALERTS & "NAGS"

- Allergy status & warnings
- Covid-19 status
- Clinical Frailty Score missing
- Freetext user alerts
- HD Session DNA in last 30 days nag
- AKI Alerts

LINKED PATIENT FILES

Enables uploading and storage of digital images, documents, and other non-Renalware-generated files. *Current options include:*

- Histology Images
- Histology Report
- MRI Images
- MRI Report
- Other Radiology Images
- Other Radiology Reports
- Echo Images
- Echo Report
- ECG
- Misc Letter
- Misc Discharge Summary
- Misc Documents

Appendix 1: General Events

Access - Anaesthetic Review	Iron Clinic
Access - Assessment	Joint CAPD/Diabetes
Access - Clinic	Joint Transplant/Diabetes
Access - Clinic Review	Joint Transplant/Renal
Access - Comment / Others	Letter
Access - MDT	Live Donor
Access - Surgery	Low Clearance
Acute Team	MDM--ADPCK
Admission	MDM--HD Access
A&E	MDM--Liver Renal Virology
A&E - Anaesthetic Review	MDM--Radiology
Anaemia	MDM--Renal Biopsy
Asked to see	MDM--Renal Sickle
Biopsy Meeting	MDM--Renal Urology
Blood Test	MDM--Transplant Waiting List
CAPD	Medication Review
CAPD Nurse Home Visit	Meeting
CAPD Outreach Clinic	Nephrology
Clinic - Access	Nutrition Assessment
Clinic - AKI	Other/Unknown
Clinic - Anaemia	Outpatients
Clinic - CAPD	Patient Discussion
Clinic - Clinic	Patient Encounter (Seen on)
Clinic - HD	Patient Form Letter
Clinic - Home HD	Patient Review
Clinic - Joint clinic	PD Line Change
Clinic - Live Donor Assessment	Pharmacist
Clinic - Live Donor FU	Physiotherapist
Clinic - Low Clearance	Plasma Exchange
Clinic - Misc / Others	Prescription change
Clinic - Other	Psychology/Psychiatry
Clinic - Outreach	Referral
Clinic - PD	Renal Biopsy Native
Clinic - Renal Obesity	Renal Biopsy Transplant
Clinic - Renovascular	Renal Palliative
Clinic - Vasculitis	Renal Supportive Care
Clinic - Walk In	Renal Unit
Complaint	Research
Conversation	Result Entry/Review
Counsellor Meeting	Social Worker
Diabetes	Swab
Dialysis Unit	Telemedicine Assessment
Dietetic assessment	Telephone Call
Dietician	Transplant
Email	Transplant Coordinator
Fax	Vaccination
Fistulaplasty	Vascular Lab
GP Follow-Up	Walk-in
Haemodialysis	Ward
Haemodialysis Unit	Weight Management
Home Visit	X-ray Meeting
Investigation	

Appendix 2: Technical Notes

TECHNICAL SPECIFICATIONS

Operating System

Renalware is deployed to Azure using App Services and can run on any Linux distribution through the use of Docker containers. (*See below.*)

Core Server Software

- PostgreSQL v. 15.0 (Azure Database for Postgres — Flexible Server)
- Ruby v. 3.1
- Rails v. 7
- Redis v. 6+

Renalware is compatible with server-less cloud Platform-as-a-Service offerings including Azure App Services, AWS Elastic Beanstalk and Google App Engine.

UKRDC & RENAL PATIENT VIEW

- Automated encrypted daily XML exports to UKRDC and Renal Patient View
- Developed in collaboration with the Renal Registry IT staff for full compliance
- The first UK renal/nephrology database system to implement the new UKRDC standard

RENALWARE & TRANSFER OF CARE

Sending GP letters electronically using Transfer of Care and MESH

When a user signs-off a letter in Renalware, an electronic copy is automatically delivered to the patient's GP. Renalware is one of a handful of applications to achieve this by implementing the new NHS Transfer Of Care initiative.

Under the hood, a FHIR XML representation of the letter is created by splitting the letter into its constituent sections — including for example a section about current medications, comprising the relevant letter text plus structured SNOMED-coded medication data — and sending this XML message electronically to the GP's system over NHS MESH using the NHS Transfer Of Care 'Outpatient Letter' workflow. On receipt at the GP's system, the letter data is stored and can be reconstituted when viewed for example by a GP.

ADDITIONAL SYSTEMS INTEGRATION

NOTE: Systems integration with Renalware is highly site-dependent.

- Incoming HL7 Pathology feed handling
- Send Letter PDFs via email to GPs/Practices (where Transfer of Care unimplemented)
- Send Letter PDF/RTF versions to EPR
- XML: transfer HD profile and session data with Diaverum dialysis machines
- Nikkiso dialysis machine interface
- Process incoming HL7 AKI scores

REPORTS & CUSTOM SQL QUERIES

Superusers can use the Reports module to create and run custom SQL queries at any time within the Renalware app, with an option to download the output as a CSV file. From the instructions:

To create a new report, work out the SQL you need (and the columns to return) and create a SQL view (ideally in the hospital's own schema eg renalware_mse so its clear it is not part of core Renalware) and then add an entry for it into the renalware.system_view_metadata table using the category of 'report'.

Naturally, those with knowledge of SQL and the Renalware schema (and appropriate database permissions) can run a wide variety of queries across the tables for clinical, research, or administrative/financial purposes and analyse or transform the data using other tools (spreadsheet, mapping, or charting apps, for example). These can of course be automated to run e.g.daily, weekly or monthly.

RENALWARE DEPLOYMENT TO AZURE

We recommend that Renalware be deployed to Microsoft Azure using the following PaaS components in the Trust's own Azure subscription:

- Azure Database for PostgreSQL - Flexible Server
- Azure App Services - Web App for Containers
- Azure Storage
- Azure Container Registry
- Private endpoints

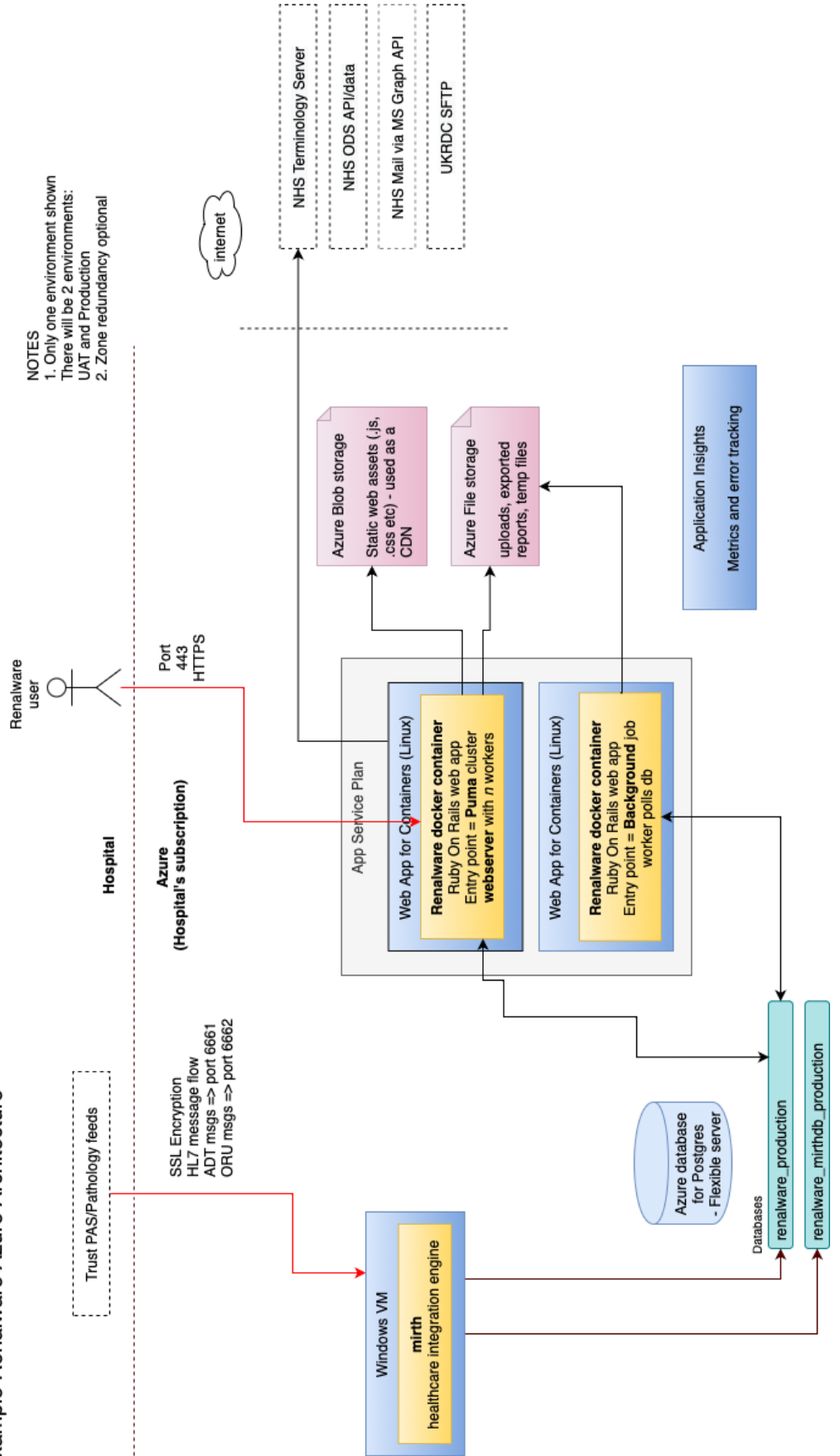
In order to interface with hospital PAS and pathology systems, we run the open source Nextgen Healthcare Mirth Connect service on an IaaS Azure Windows VM, configured to receive and store ORU and ADT HL7 or FHIR messages. Data in these messages updates information on matching patients in Renalware as it arrives, and archives messages for non-Renalware patients. When a new patient is added to Renalware, any pathology messages we have previously received for them are imported to create their historical pathology record.

We typically create two environments in Azure: UAT (or Test) and Production. Deploying a new version of the application entails building a Docker image and pushing it to an Azure container registry; from there we can either manually deploy to UAT for testing, or automatically deploy to UAT using an Azure DevOps pipeline or Github action. Once tested, the image is promoted to Production.

Should you need more information, our developers are happy to discuss technical and environmental requirements of the Renalware deployment.

See the next page for an example Renalware Azure deployment diagram.

Example Renalware Azure Architecture



NOTES
 1. Only one environment shown
 There will be 2 environments:
 UAT and Production
 2. Zone redundancy optional