Design and development of a REDCap database to automatically generate urodynamic study reports: A novel approach.

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AIMS OF STUDY

REDCap is an electronic data capture system that allows collection, storage, and analysis. It has features such as surveys, multi-language tools, calculated values and piping to optimize data collection. Piping allows users to insert previously recorded data into instruments, emails, and other locations (1).

Data is uploaded to REDCap in two ways: it can be manually introduced from electronic medical records with prior informed consent or through patients answer surveys. In order to improve efficiency in this task, we searched for alternatives tools for collecting data from patients while optimizing data processing in the electronic health record.

STUDY DESIGN, MATERIALS AND METHODS

We search for ways we could integrate the available tools of REDCap, like surveys and piping to enter in real time the data of the urodynamics carried out in our service to our database. In this way, at the end of the procedure, we could have a structured report with all the information that was documented, which can be included in the patient's medical record and sent to his doctor. To achieve this, we review the current criteria from the International Continence Society for a urodynamic study (2).

We organized the information we wanted to include for both clinical practice and research projects. Therefore, we include basic demographic and clinical data about the patient like age, weight, size, pathologic antecedents, and reason for the procedure.

We developed a script of the survey performed to patients in conjunction with the urologists of the service following the recommendations of the ICS.

Integrating all this information, we designed a draft structured report for the urodynamic study, using branching logic by gathering all the information collected from the patient's admission until the end of the procedure.

REDCap
Research Electronic Data Capture

RESULTS

1. PATIENT SCALES (VIA EMAIL)

Opciones de encuesta:

Editing existing Record ID **1160**.

Record ID	1160
IPSS	
Over the past month, how often have you had a sensation of not emptying your bladder completely after you finish urinating?	○ Not at all ○ Less than 1 time in 5 ○ Less than half the time ○ About half the time ○ More than half the time ◉ Almost always restablecer el valor

2. DOCTOR REPORT ENTRY (DURING EXAM)

Uroflowmetry	
UROFLOW CHARACTERISTIC	◉ NORMAL ○ ABNORMAL ○ ABSCENT ○ NOT EVALUABLE restablecer el valor
UROFLOW TRAVE	○ CONTINOUS ○ INTERMITENT ○ SMOOTH ◉ FLUCTUANT ○ OTHER restablecer el valor
Q MAX UROFLOW	26
Cystometry	
TYPE OF CATHETER	◉ CYSTOMETRIC CATHETER ○ NELATON CATHETER restablecer el valor MONOLUMEN = NELATON
FILLING RATE	60 PROMEDIO
PATIENT POSITION	◉ SITTING ○ STANDING ○ SUPINE restablecer el valor VERIFICAR CON GENERO
ARE THE SENSATIONS DESCRIBED	◉ YES ○ NO restablecer el valor
FIRST SENSATION	150
FIRST DESIRE TO VOID	170
Pressure flow study	
PRESSURE OF THE DETRUSOR IN Q MAX	55
Q MAX	11
VOLUME VOIDED	190
FILLING VOLUME	400
VOIDED PERCENTAGE	46.75 Ver equacion
POST VOIDING RESIDUE	213 Ver equacion
BOOI	33 Ver equacion
BCI	110 Ver equacion

USING REDCAP TO GENERATE URODYNAMIC STUDY REPORTS: A NOVEL APPROACH.

3. REDCAP REPORT USING PIPPING FEATURE

SCALES:
- IPSS: [ipss_sel_1:value] + [ipss_sel_2:value] + [ipss_sel_3:value] + [ipss_sel_4:value] + [ipss_sel_5:value] + [ipss_sel_6:value] + [ipss_sel_7:value] = [ipss_total].
- QOL: [qol]
- SHIM: [shim_sel_sel_1:value] + [shim_sel_2:value] + [shim_sel_3:value] + [shim_sel_4:value] + [shim_sel_5:value] = [shim].

THE PATIENT IN FULL USE OF HIS MENTAL FACULTIES IS PREVIOUSLY EXPLAINED ABOUT THE NATURE, INDICATIONS, ADVANTAGES, RISKS, COMPLICATIONS AND INHERENT ALTERNATIVES OF THE PROCEDURE, CONCERNS ARE SOLVED; CONSEQUENTLY, THE INFORMED CONSENT IS SIGNED ACCORDINGLY.

FLUJOMETRY
[uroflowmetry] FREE FLOW METRY.
CURVE MORPHOLOGY [uroflow_curve].
MAXIMUM FLOW RATE [qmax_uroflow] MILLILITERS / SECOND
AVERAGE FLOW RATE [average_uroflow] MILLILITERS / SECOND
POSTMICCIONAL RESIDUE OF [rpm_pre] MILLILITERS MEASURED BY [type_rpm_pre].
VOLUME VOIDED OF [volume_uroflow] MILLILITERS
VOIDING TIME: [time_flow_time] SECONDS
VOIDED PERCENTAGE: [effi_void_effi_efflux] %.
REPRESENTATIVE MICTURITION: [representative_uroflow] % REPRESENTATIVE MICTURITION: [representative_uroflow] % REPRESENTATIVE MICTURITION: [representative_uroflow].
POST-PASS [type_probe_type] OF 7 FRENCH PRIOR URETHRAL LUBRICATION WITH XYLOCAINE JALEA, RECTAL PROBE PASSING, INSTILLATION OF STERILE WATER AT [filling_rate] MILILITERS/MINUTE. PREVIOUS EQUIPMENT CALIBRATION AND ARTIFACTS CORRECTION. PATIENT IN [initial_position] POSITION. ADEQUATE TECHNICAL QUALITY OF THE STUDY FOUND:

CYSTOMETRY
VESICAL SENSITIVITY [sensation_cystometry].
FIRST SENSATION [first_sensation] MILLILITERS, FIRST DESIRE TO VOID [first_desire] MILLILITERS. STRONG DESIRE TO VOID [strong_desire] MILILITERS
BLADDER CAPACITY ACHIEVED [capacity_value] MILILITERS: [cystometric_capacity].
COMPLIANCE [compliance_cystometry] [major_compliance] MILLILITERS / CENTIMETERS OF WATER [major_accommodation].
INVOLUNTARY CONTRACTIONS OF THE DETRUSOR DURING THE STUDY [hyperactive_comment].

4. FINAL REPORT

STUDY REPORT

TEST DATE: 29-03-2023

SCORES:

IPSS: 5 + 4 + 1 + 1 + 5 + 4 + 1 + 4 = 24
QOL: 6
SHIM: 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 5
ICIQ: 5 + 4 + 4 + 9 = 18
ICIQ4 = Before going to the toilet
URINARY FREQUENCY: 4 x 4

HISTORY:
LOWER URINARY TRACT SYMPTOMS WITH PREDOMINANT FILLING SYMPTOMS.
ALSO HAS STRESS URINARY INCONTINENCE.
PATIENT WITH HISTORY OF RADICAL PROSTATECTOMY AND COMPLEMENTARY RADIOTHERAPY 2 YEARS AGO.

THE PATIENT IN FULL USE OF HIS MENTAL FACULTIES IS PREVIOUSLY EXPLAINED TO HIM ABOUT THE NATURE, INDICATIONS, ADVANTAGES, RISKS, COMPLICATIONS AND INHERENT ALTERNATIVES OF THE PROCEDURE, CONCERNS ARE SOLVED; CONSEQUENTLY, THE INFORMED CONSENT IS SIGNED IN CONFORMITY.

FLUJOMETRY

NORMAL FREE UROFLOWMETRY
FLUCTUATING CURVE MORPHOLOGY
MAXIMUM FLOW RATE 26 MILLILITERS / SECOND
AVERAGE FLOW RATE 12 MILLILITERS/SECOND
POSTVOID RESIDUAL VOLUME OF 350 MILLILITERS MEASURED BY CATHETERIZATION
VOLUME VOIDED OF 170 MILLILITERS
VOIDING TIME: 14 SECONDS
VOIDED PERCENTAGE: 33 %.
REPRESENTATIVE MICTURITION: Yes

SUBSEQUENT PASSAGE OF 7 FRENCH CYSTOMETRIC CATHETER AFTER URETHRAL LUBRICATION WITH XYLOCAINE JELLY, PASSAGE OF RECTAL CATHETER, INSTILLATION OF STERILE WATER AT 60 MILLILITERS/MINUTE. PREVIOUS CALIBRATION OF THE EQUIPMENT AND CORRECTION OF ARTIFACTS. PATIENT IN SEATED POSITION. ADEQUATE TECHNICAL QUALITY OF THE STUDY WAS FOUND:

CYSTOMETRY

INCREASED BLADDER SENSITIVITY.
FIRST SENSATION 150 MILLILITERS, FIRST DESIRE TO VOID 170 MILLILITERS. STRONG DESIRE TO VOID 190 MILLILITERS
BLADDER CAPACITY REACHED 400 MILLILITERS NORMAL.
NORMAL COMPLIANCE GREATER THAN 30 ML CMH20 MILLILITERS / CENTIMETERS OF WATER.
NO INVOLUNTARY DETRUSOR CONTRACTIONS DETECTED DURING THE STUDY.

CONCLUDING MESSAGE

REDCap is a powerful data collection platform, but so far, was only used for data storage. The use of advanced REDCap tools like pipping, branching logic, and surveys, allows expanding its possibilities. We developed structured reports that can be included in the medical records, achieving several benefits for our team. We optimize the acquisition of information for future research in urology, decreasing the workload on the research group. We standardized urodynamic reports, which are now based on ICS recommendations.

References

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2.The 2023 compilation of the International Continence Society Standardisations, Consensus statements, Educational modules, Terminology and Fundamentals documents, with the International Consultation on Incontinence algorithms Vienna, Austria.
3.Abdelmoteleb H, Kamel MI, Hashim H. The association between the ICIQ-LUTS and the ICIQ-bladder diary in assessing LUTS. Neurourol Urodyn. 2017 Aug 1;36(6):1601–6.