Safe urodynamic practices in times of COVID-19: What can be accomplished and what can be added?

João A. Pereira-Correia | Carlos M. P. P. Gomes | Paulo H. N. Barbosa | Bruno A. Salomão | Heitor S. Morais | Valter J. F. Muller

Abstract
Aim: To present feedback, after applying national and international urodynamic study (UDS) recommendations for safe practice during the COVID-19 pandemic.

Methods: We created a checklist to assess the feasibility of performing UDS recommendations for safe practice during the COVID-19 pandemic from the first week of May 2021 to the last week of July 2021.

Results: One hundred patients were analyzed during the study period. We observed that all preventive recommendations for the steps that precede UDS could be followed in full. However, some guidelines for performing the exam were not feasible in all patients. We have successfully adopted other safety measures for all patients.

Conclusions: The COVID-19 pandemic will likely persist for several more years. We believe that continuous improvement, revision, and updating of existing protocols and guidelines for the safe practice of UDS in times of COVID-19, as we propose in this study, should be encouraged.

KEYWORDS
coronavirus, COVID-19, guideline, urodynamic study

1 INTRODUCTION

The COVID-19 pandemic has disrupted urological practice substantially. Reductions in the number of surgeries, medical consultations, and elective procedures are examples of impediments due to the social distancing necessary to control SARS-CoV-2 transmission. In this context, the performance of urodynamic studies (UDS) has also been encumbered.

Because UDS are generally indicated to diagnose nonurgent conditions, many patients postponed their UDS, and many physicians, in turn, reduced the frequency of performing or simply stopped performing these exams in recent months. However, as UDS are considered the gold standard for the diagnosis of various lower urinary tract disorders, we do not yet know the long-term health consequences of this reduced access to care.

Better knowledge of COVID-19 and its transmission dynamics, as well as the introduction of diagnostic methods and vaccines, have led to the publication of recommendations for the safe practice of UDS, to facilitate the delivery of urologic care even in times of pandemic disease. We present our feedback, after applying these recommendations in daily practice, and offer pertinent recommendations for future implementation.
2 | MATERIALS AND METHODS

After authorization from the local Research Ethics Committee, we prospectively analyzed the manner in which UDS were conducted from the first week of May 2021 to the last week of July 2021 in our urodynamic center, using the latest version of Dynamed™ (Dynamed™), urodynamic equipment (Dynapack Slim™ Hardware and Urocommander™ Software), and following the recommendations for good practice endorsed by the International Society of Continence (ICS).4–6

We created a checklist to assess the feasibility of performing UDS based on national7 and international8 recommendations for safe practice during the COVID-19 pandemic (Table 1).

Statistical analysis was performed using GraphPad Prism™ software, version 7, applying Kolmogorov–Smirnov’s test for normality analysis. For data with a Gaussian distribution, a comparative intergroup evaluation Student’s t-test was used. However, for data with a non-Gaussian distribution, the Kruskal–Wallis test was used, adopting the standard significance value of $p < 0.05$.

3 | RESULTS

One hundred patients were analyzed during the study period. Results are shown in Table 2.

We observed that all preventive recommendations for the steps that precede UDS could be followed in full (Table 2). However, some guidelines for performing the exam were not feasible in all patients.

Maintaining the recommended distance of 2 m between the examiner and the patient was not possible in 28 patients (approximately 30% of cases), due to the dislodging of urethral catheters caused by the loss of adhesion of the catheter to the patients’ skin. This occurred in patients who had urinary leakage at minimal effort and/or continuous urination that moistened the region where the adhesive tape was applied, forcing the examiner to approach the patient during the procedure.

The replacement of cough by Valsalva maneuver was not possible in 44% of the patients, due to inadequate generation of intra-abdominal pressure that confounded assessments for exertion-related and post-prostatectomy urinary incontinence. Furthermore, examination in the standing position was impossible for patients for whom the combination of perineal electromyography with UDS was indicated (12 patients).

The other recommendations applicable during UDS, as shown in Table 2, could be applied to 100% of the patients. It is noteworthy that ventilation of the examination room was facilitated by keeping the windows open, after confirming that the patient’s privacy would be maintained.

We have successfully adopted other safety measures in all patients (Table 3).

4 | DISCUSSION

We observed that not all recommendations for conducting UDS safely during the COVID-19 pandemic can be implemented in daily practice (Table 4). We also realized that even the recommendations that can be fully implemented may be difficult to apply under certain conditions.

The replacement of the cough maneuver by Valsalva maneuver, for example, is proposed in safety protocols to avoid the dispersion of aerosols, an important mode of COVID-19 transmission.9 This intervention, however, was the most detrimental to good urodynamic practice, since in almost half of our sample, it precluded an adequate investigation of bladder function during states of high intra-abdominal pressure. Although the International Consultation on Incontinence (ICI) does not recommend Valsalva leak point pressure as a single factor to grade the severity of urinary incontinence, or to predict urinary stress incontinence (recommendation Grade C) and surgical treatment outcomes,10 optimal urodynamic practice entails the investigation of the effects of pelvic floor stress and external urethral sphincter function under varying degrees of intra-abdominal pressure, requiring the use of cough during UDS in the vast majority of patients. Despite these findings, we believe that Valsalva (or other abdominal pressure rises maneuvers) should be tried first, and only then do coughs.

Close proximity between the examiner and the patient can facilitate COVID-19 transmission.11,12 The ideal distance between the patient and examiner was not preserved in 28% of patients, due to repositioning of displaced urethral catheters, especially when the medial surface of the patient’s thigh had been moistened after urinary incontinence during exercise testing. We believe that topical adhesives, such as benzoin tincture, could be used in patients with histories of urinary incontinence.

The use of the orthostatic position, which facilitates the identification of urinary losses at a distance, was not possible during perineal electromyography, thus obviating the maintenance of an adequate distance between physician and patients. Some studies have shown that performing electromyography in the orthostatic position could compromise the assessment of the test results.13–15 Thus, we have a
Our urodynamic center does not perform the study in this position.

Examination room ventilation is one of the primary safety measures to prevent the spread of COVID-19.16,17 Although we managed to keep a wide window open during all UDS without compromising patient privacy, we acknowledge that this approach is not possible in all settings. Some buildings do not have windows in urodynamic exam rooms, and weather conditions such as extreme cold may obviate this recommendation in some locations. In these cases, an upgrade of ventilation systems with portable air cleaners or disinfectants (such as UV lamps or high-efficiency filtration systems) to remove airborne pathogens, including SARS-CoV-2, could be useful.16

### Table 1

**Questionnaire designed to prospectively assess the feasibility of applying recommendations for the safe practice of urodynamic testing during the COVID-19 pandemic**

| Recommendation                                                                 | Viability                                                                 |
|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| **Before urodynamic studies (UDS)**                                           |                                                                          |
| Medical history by phone                                                      | () Viable () Viable with adaptations () Not viable                       |
| History of symptoms and/or hospitalization for COVID-19                       | () Viable () Viable with adaptations () Not viable                       |
| Case prioritization                                                           | () Viable () Viable with adaptations () Not viable                       |
| Scheduling fewer UDS in each day and be with more time between individual appointments | () Viable () Viable with adaptations () Not viable                       |
| Body temperature measurement                                                  | () Viable () Viable with adaptations () Not viable                       |
| **During UDS**                                                                |                                                                          |
| Adequate distance between examiner and patient                                | () Viable () Viable with adaptations () Not viable                       |
| Replacement of cough by Valsalva maneuver                                      | () Viable () Viable with adaptations () Not viable                       |
| Use of personal protective equipment                                          | () Viable () Viable with adaptations () Not viable                       |
| Reduced number of people in the exam room                                     | () Viable () Viable with adaptations () Not viable                       |
| Room cleaning                                                                  | () Viable () Viable with adaptations () Not viable                       |
| Handwashing                                                                   | () Viable () Viable with adaptations () Not viable                       |
| Examination in standing position                                              | () Viable () Viable with adaptations () Not viable                       |
| Examination room ventilation                                                  | () Viable () Viable with adaptations () Not viable                       |

### Table 2

**Results of the feasibility of applying UDS safe practice recommendations during pandemic**

| Recommendation                                                                 | Viable | Not viable | p        |
|-------------------------------------------------------------------------------|--------|------------|----------|
| Medical history by phone                                                      | 100%   | 0%         | <0.0001  |
| History of symptoms and/or hospitalization for COVID-19                       | 100%   | 0%         | <0.0001  |
| Case prioritization                                                           | 100%   | 0%         | <0.0001  |
| Scheduling fewer UDS                                                          | 100%   | 0%         | <0.0001  |
| Body temperature measurement                                                  | 100%   | 0%         | <0.0001  |
| Adequate distance between examiner and patient                                | 72%    | 28%        | 0.0002   |
| Replacement of cough by Valsalva maneuver                                     | 56%    | 44%        | 0.0002   |
| Use of personal protective equipment                                          | 100%   | 0%         | <0.0001  |
| Reduced number of people in exam room                                         | 100%   | 0%         | <0.0001  |
| Room cleaning                                                                  | 100%   | 0%         | <0.0001  |
| Handwashing                                                                    | 100%   | 0%         | <0.0001  |
| Examination in standing position                                              | 88%    | 12%        | <0.0001  |
| Examination room ventilation                                                  | 100%   | 0%         | <0.0001  |

### Table 3

**Other measures taken to improve safety of UDS during the COVID-19 pandemic**

| Other adopted safety measures                                                                 |
|-----------------------------------------------------------------------------------------------|
| **Before UDS**                                                                               |
| Scheduling exams outside of rush hours, avoiding long stays in urban transportation          |
| Patient and healthcare team testing for SARS-CoV-2 (RT-PCR)                                   |
| Requesting proof of COVID-19 vaccination                                                       |
| **During UDS**                                                                               |
| Maintenance of minimal furniture necessary for urodynamic practice in the exam room           |

Abbreviation: UDS, urodynamic studies.

In our urodynamic center we do not perform the study in this position.
4.1 | Additions to protocols

We have implemented additional measures into our practice, and recommend that they be incorporated into the existing protocols.

4.1.1 | Reduction of furniture in the exam room

Mathematical models of indoor air circulation suggest that environments with lower occupancy present a diminished risk of COVID-19 transmission.\(^{18-21}\) Thus, in addition to decreasing the number of individuals in the UDS room, we also recommend reducing the amount of furniture to further mitigate crowding.

4.1.2 | Testing and vaccination

Massive testing utilizing RT-PCR is an important strategy to control COVID-19 transmission.\(^{22}\) Therefore, following the recommendations of the Centers for Disease Control and Prevention, we perform and recommend testing of all patients and health professionals who provide UDS.

Another adopted recommendation is complete COVID-19 vaccination of our staff, considering evidence available in our country that associates drastic reductions of COVID-19 incidence and mortality with massive vaccination of the population.\(^{23}\)

4.1.3 | Scheduling at times of decreased vehicular traffic (avoiding rush hours)

The effect of crowding on COVID-19 transmission has been highlighted in several studies, such as the elegant publication by Geng et al.\(^{24}\) Yasri and Wiwanitkit\(^{25}\) have highlighted the potential for COVID-19 transmission during the use of public transportation. Consequently, we have implemented and recommended the scheduling of UDS patient appointments at times when vehicular traffic is less intense. Thus, patients who use public transportation will avoid travel in crowded vehicle interiors during rush hours.

5 | CONCLUSION

The COVID-19 pandemic will likely persist for several more years, especially due to vaccine hesitancy and barriers to vaccine access in some population groups.
Consequently, we believe that continuous improvement, revision, and updating of existing protocols and guidelines for the safe practice of UDS in times of COVID-19, as we propose in this study, should be encouraged.

**CONFLICT OF INTERESTS**
The authors declare no conflict of interest.

**ETHICS STATEMENT**
Study approval number by the local ethics committee: 77023617.6.0000.5284.

**AUTHOR CONTRIBUTIONS**
João A. Pereira-Correia: Data collection. Carlos M. P. P. Gomes: Conception or design of the work; critical revision of the article. Paulo H. N. Barbosa: Conception or design of the work; critical revision of the article. Bruno A. Salomão: Conception or design of the work; critical revision of the article. Heitor S. Morais: Conception or design of the work; critical revision of the article. Valter J. F. Muller: Data collection; data analysis and interpretation.

**DATA AVAILABILITY STATEMENT**
Data Availability Statement is not available.

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