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Urinary, Faecal and Sexual Disorders After Traumatic Spinal Cord Injury: Frequency, Management and Recovery in 366 Patients at Bouaké University Hospital (Côte d'Ivoire)

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Abstract

➢ *Background:*
After a traumatic spinal cord injury (SCI), bladder, bowel and sexual disorders weigh heavily on autonomy, and African data are scarce.

➢ *Objective:*
We described their frequency, management and recovery in an Ivorian referral centre.

➢ *Methods:*
Single-centre cohort of 366 patients with confirmed SCI, with a retrospective phase (2017–2021) and a prospective phase (1 January 2025–30 June 2026), reported according to STROBE. The primary outcome was the presence of a vesico-sphincteric disorder (urinary or faecal). Secondary outcomes were sexual dysfunction, functional recovery and in-hospital mortality. We compared patients by ASIA grade and lesion level, then used logistic regression to look for factors associated with recovery.

➢ *Results:*
Vesico-sphincteric disorders affected 227 patients (62.0%): urinary incontinence 41.0%, faecal incontinence 25.7%, acute urinary retention 18.6%. Sexual dysfunction was reported by 15.8% of patients. Frequency fell from ASIA grade A to grade E (84.4% to 23.1%), after 17 ASIA E patients were reclassified on record audit; it reached 84.4% in complete injuries versus 47.0% in incomplete injuries ($p < 0.001$) and did not vary with lesion level ($p = 0.40$). In-hospital mortality was 25.1% with disorders versus 5.0% without ($p < 0.001$). The difference persisted after stratification by severity (ASIA A vs B–E; Mantel-Haenszel OR 3.16; 95% CI 1.34–7.47) and after adjustment for ordinal ASIA grade and age (adjusted OR 2.99; 95% CI 1.25–7.15); these analyses are exploratory. Among the 227 affected patients, urinary management combined bladder rehabilitation (27.3%), spinal surgery (22.5%), intermittent catheterisation (22.0%) and simple monitoring (17.6%); bowel management relied mainly on a bowel programme (57.3%). For sexuality, 73.1% had received counselling only and 23 patients (10.1%) a specialised treatment. Among the 170 survivors with initial disorders (median follow-up 45 days [14–180]), recovery was partial in 38.8%, absent in 32.9% and replaced by persistent bladder dysfunction in 28.2%. No clinical variable tested was associated with recovery (inconclusive result).

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➢ *Conclusion:*

These disorders are frequent and follow lesion completeness. They are associated with in-hospital mortality, including after stratification by severity (exploratory analysis). Sexual function is under-assessed. Recovery is modest and no usual clinical variable predicts it (inconclusive result). Early multidisciplinary care, integrated into the neurosurgical pathway, is needed.

Keywords: *Traumatic Spinal Cord Injury; Neurogenic Bladder; Sexual Dysfunction; ASIA Grade; Côte d'Ivoire.*

I. INTRODUCTION

After a traumatic spinal cord injury (SCI), bladder, bowel and sexuality often escape the patient's control. Damage to the spinal pathways that command micturition, defaecation and sexual function causes a neurogenic bladder (bladder dysfunction due to damage to the nervous system), a neurogenic bowel and sexual disorders. The consequences are serious: recurrent urinary infections, damage to the upper urinary tract, pressure ulcers, social isolation and a profoundly altered daily life [1–4].

For a long time, SCI care meant decompressing the cord, stabilising the spine and hoping for motor recovery. Patients now live longer, so chronic sequelae must be addressed. In low-resource countries the neurosurgeon is often the first specialist seen, sometimes the only one. Recognising these disorders early is therefore part of the job.

For patients, these functions matter a great deal: several studies rank them among their priorities, sometimes ahead of walking [5,6]. Managing them — suitable bladder drainage with clean intermittent catheterisation, a bowel programme, support for sexual health — protects the kidneys, prevents complications and eases social reintegration. Detailed international guidelines exist [7–10].

Yet these disorders are poorly documented in African series. These report mainly mortality, epidemiology or surgical results, rarely functional complications [11,12]. Where single-use catheters, urodynamics, pelvic-floor rehabilitation and sexology are hard to access, describing them is still necessary to organise care.

We set out to describe the frequency of vesico-sphincteric disorders in patients managed for SCI at Bouaké University Hospital. We also described sexual dysfunction, management, functional recovery and mortality, and looked for factors associated with recovery. We expected these disorders to reflect neurological severity, to weigh on in-hospital prognosis and to show limited recovery. To our knowledge, no study from francophone West Africa has combined these four aspects: frequency, associated factors, management and recovery.

II. PATIENTS AND METHODS

➢ *Study Design, Setting and Period*

Single-centre cohort from the Department of Neurosurgery of Bouaké University Hospital (Côte d'Ivoire), reported according to STROBE [13]. It includes a retrospective phase (patients hospitalised from 1 January 2017 to 31 December 2021) and a prospective phase (1 January 2025 to 30 June 2026). The years 2022 to 2024 are not part of the audited database available to us. The exact distribution of the 366 patients between the two phases could not be retrieved from the registers. Bouaké University Hospital is the main referral centre for central Côte d'Ivoire and receives patients from several regions.

➢ *Population*

We included all consecutive patients hospitalised for SCI confirmed clinically and by CT or MRI, to limit selection bias. Non-traumatic injuries, duplicates and inconclusive cases identified at audit were excluded. This left 366 patients (Figure 1). Vesico-sphincteric disorders were recorded at admission from the history and examination of the neurosurgeon (systematic screening in the prospective phase, record review in the retrospective phase). The recovery analysis covered survivors who had disorders at admission.

➢ *Variables and Definitions*

We graded neurological deficit with the American Spinal Injury Association Impairment Scale (ASIA), following the International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) [14]. The grade used is that of the initial examination, after audit of ASIA E records. This audit covered the 43 patients classified ASIA E at admission (23 with a vesico-sphincteric disorder, 20 without). Seventeen of the 23 patients with a disorder were reclassified as incomplete injuries (6 as grade C, 11 as grade D) because their initial sacral examination was incomplete. The other 6 remained ASIA E; their disorders were judged transient or non-neurological. The 20 patients without a disorder were all confirmed as ASIA E.

Vesico-sphincteric disorders comprised urinary incontinence (involuntary leakage of urine), acute urinary retention (inability to void with a distended bladder) and faecal incontinence (loss of control of stools), recorded clinically at admission. The global item “vesico-sphincteric disorders” designated any documented urinary or faecal disorder, in a specific form or as a global sphincter mention. In 17 patients this global item was isolated, with no recorded subtype; we excluded them in a sensitivity analysis.

We defined sexual dysfunction as any alteration of libido, erection, ejaculation, orgasm or vaginal lubrication, or any pain during intercourse, reported by the patient or documented in the record, in the spirit of the International SCI Sexual Function Basic Data Set [15], but without a standardised questionnaire (IIEF, FSFI). Management was classified into urinary, anorectal and sexual modalities.

Urinary complications were the urinary infections documented clinically or biologically during the stay; the database could not distinguish symptomatic infection from colonisation, nor record other complications (lithiasis, renal damage).

In survivors, we classified functional recovery at the last documented clinical assessment into three categories: partial recovery (documented improvement of continence or of the ability to void, without return to normal function), no recovery, or persistent neurogenic bladder dysfunction. Patients who died could not be assessed. The data collection did not provide a "complete recovery" category, and the categories "no recovery" and "persistent dysfunction" were not strictly mutually exclusive.

➢ *Ethical Considerations*

The study complies with the Declaration of Helsinki. The Institutional Ethics Committee of Bouaké University Hospital approved the protocol (CEI/CHU-BKE/99/2026). Consent was waived for retrospective use of records, after anonymisation. Patients in the prospective phase, or their legal representatives, gave informed consent.

➢ *Statistical Analysis*

We present categorical variables as counts and percentages, and quantitative variables as median and interquartile range [IQR]. We compared prevalences by ASIA grade, lesion level and vital status with the χ^2 test (Yates correction for 2 × 2 tables) or Fisher's exact test, and tested the trend across ordinal ASIA grade (A to E) with the Cochran-Armitage test.

Two logistic regressions were built. The first, in the whole cohort, looked for factors associated with the presence of disorders at admission (complete ASIA A injury, cervical level, sex, spinal instability, polytrauma, age). The second, in survivors with initial disorders, looked for factors associated with at least partial recovery (complete ASIA A injury, cervical level, sex, early surgery, age). Early surgery was coded 1 if the operation took place within 3 days of admission and 0 if it took place later or not at all: non-operated patients therefore joined the reference category. We chose variables a priori, according to clinical interest and the literature, without automatic selection. The study was mainly descriptive; these models are exploratory.

For the disorder model, we measured discrimination (area under the ROC curve, AUC), fit (Hosmer-Lemeshow), explained variance (Nagelkerke R^2) and collinearity (variance inflation factor, VIF). Crude and adjusted odds ratios (OR) are given with their 95% confidence interval (CI), as are the main proportions (Wilson method). In-hospital mortality was not the primary outcome. We analysed it in an exploratory way, by stratification on severity (ASIA A vs B–E, a split that the audit of ASIA E records does not change) with a Mantel-Haenszel OR, then by a logistic regression adjusted for ASIA grade (ordinal, per grade of severity), the presence of disorders and age.

Key variables (ASIA grade, lesion level, disorders, recovery, vital status) were complete. Other missing data accounted for less than 5% and were handled by complete-case analysis. Sexual function was an exception: it was not documented in 76 patients (20.8%, including 23 who died), who were counted as without dysfunction in comparisons by ASIA grade. The 57 patients who died among those with disorders could not be assessed for recovery and were excluded from that analysis. The significance threshold was 0.05. Analyses used Python 3.12 (pandas, statsmodels, scipy).

III. RESULTS

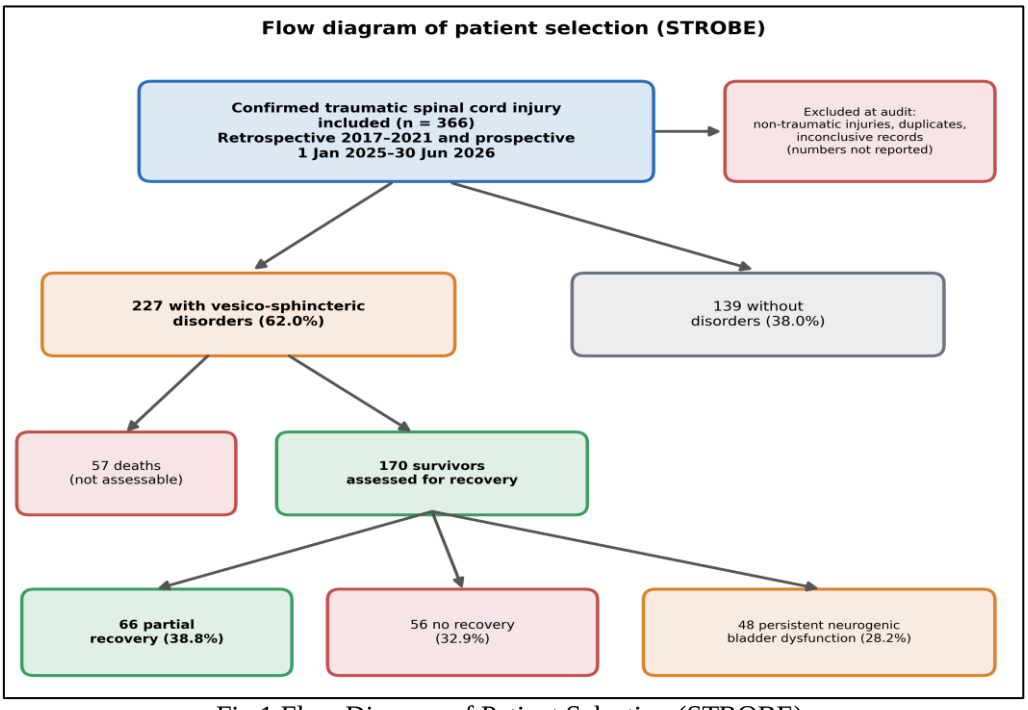


Fig 1 Flow Diagram of Patient Selection (STROBE).

➢ *General Characteristics and Prevalence of Disorders*

The 366 patients had a median age of 35 years, and 80.9% were men. At admission, 227 (62.0%; 95% CI 56.9–66.8) had a vesico-sphincteric disorder; without the 17 patients whose global item was isolated, prevalence fell to 57.4% (210/366). Urinary incontinence dominated (150 patients; 41.0%; 95% CI 36.1–46.1), ahead of faecal incontinence (94; 25.7%; 95% CI 21.5–30.4) and acute urinary retention (68; 18.6%; 95% CI 14.9–22.9). Sexual dysfunction was reported by 58 patients (15.8%; 95% CI 12.5–19.9), or 20.0% (58/290) of patients whose sexual function was documented. This figure is probably underestimated: assessment took place in the acute phase, without a questionnaire (Table 1; Figure 2).

Table 1 Prevalence of Vesico-Sphincteric Disorders and Sexual Dysfunction at Admission (n = 366).

Disorder	n (%)
Vesico-sphincteric disorders (global)	227 (62.0%)
Urinary incontinence	150 (41.0%)
Faecal incontinence	94 (25.7%)
Acute urinary retention	68 (18.6%)
Sexual dysfunction	58 (15.8%)

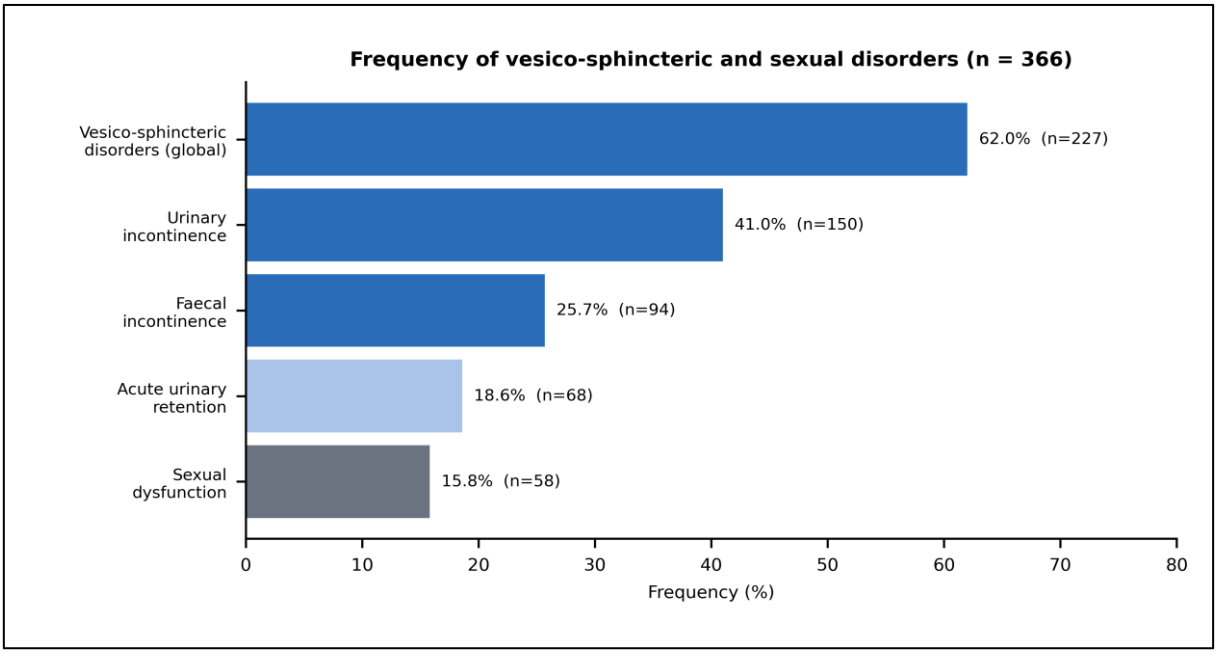


Fig 2 Prevalence of Vesico-Sphincteric Disorders and Sexual Dysfunction in the Cohort.

➢ *Relationship with Neurological Severity and Lesion Level*

The prevalence of disorders fell steadily from ASIA grade A to grade E: 84.4%, 72.5%, 48.5%, 36.8% and 23.1% (Cochran-Armitage test, $p < 0.001$). Complete injuries (ASIA A) were affected in 84.4% of cases, versus 47.0% of incomplete injuries B–E ($p < 0.001$). These grades are those obtained after the audit of ASIA E records (see Variables and Definitions). Among the 23 patients classified E at admission with a disorder, 17 were reclassified (6 to C, 11 to D) and 6 remained E. The 20 ASIA E patients without a disorder were all confirmed, giving 26 ASIA E patients after audit, 6 of them with a disorder. Before the audit, 23 of the 43 E patients (53.5%) had the global item, with only 6 subtype events (urinary incontinence 4, faecal 1, retention 1). These 6 events concerned 6 distinct patients, who remained E; the 17 reclassified patients had no recorded subtype, and the subtype percentages for grades C to E are calculated on the revised numbers. Urinary incontinence (70.7% in ASIA A vs 21.0%; $p < 0.001$) and faecal incontinence (41.5% vs 15.1%; $p < 0.001$) followed the same gradient, less clearly for urinary incontinence, which was slightly more frequent in ASIA E (15.4%) than in ASIA D (10.5%). Acute retention (25.2% vs 14.2%; $p = 0.012$) and sexual dysfunction (23.1% vs 11.0%; $p = 0.003$) had no regular gradient: retention reached 22.7% in ASIA C, almost as high as in ASIA A, and sexual dysfunction peaked in ASIA C (30.3%), with no case in ASIA D or E (Table 2; Figure 3).

Lesion level did not significantly change the frequency of disorders: cervical 58.5%, thoracic 67.7%, lumbar 62.5%, sacral 54.5% ($p = 0.40$; Table 3). This comparison lacks power (only 11 patients at sacral level, minimum expected count 4.2), and we analysed the vertebral level of the injury, not the neurological level. In this series, lesion completeness therefore weighs far more than topography.

Table 2 Prevalence of Disorders by ASIA Grade at Admission (%).

Disorder	ASIA A	ASIA B	ASIA C	ASIA D	ASIA E	p*
Vesico-sphincteric disorders	84.4	72.5	48.5	36.8	23.1	<0.001
Urinary incontinence	70.7	47.1	15.2	10.5	15.4	<0.001
Faecal incontinence	41.5	27.5	16.7	9.2	3.8	<0.001
Acute urinary retention	25.2	17.6	22.7	7.9	3.8	0.012
Sexual dysfunction	23.1	7.8	30.3	0.0	0.0	0.003

* Comparison of ASIA A (complete injury) versus incomplete grades B–E (χ^2 test with Yates continuity correction). Counts of vesico-sphincteric disorders by grade after audit of ASIA E records: A 124/147, B 37/51, C 32/66, D 28/76, E 6/26 (before audit: C 26/60, D 17/65, E 23/43). The 17 reclassified patients had no recorded specific subtype; subtype percentages for grades C to E are calculated on the revised numbers.

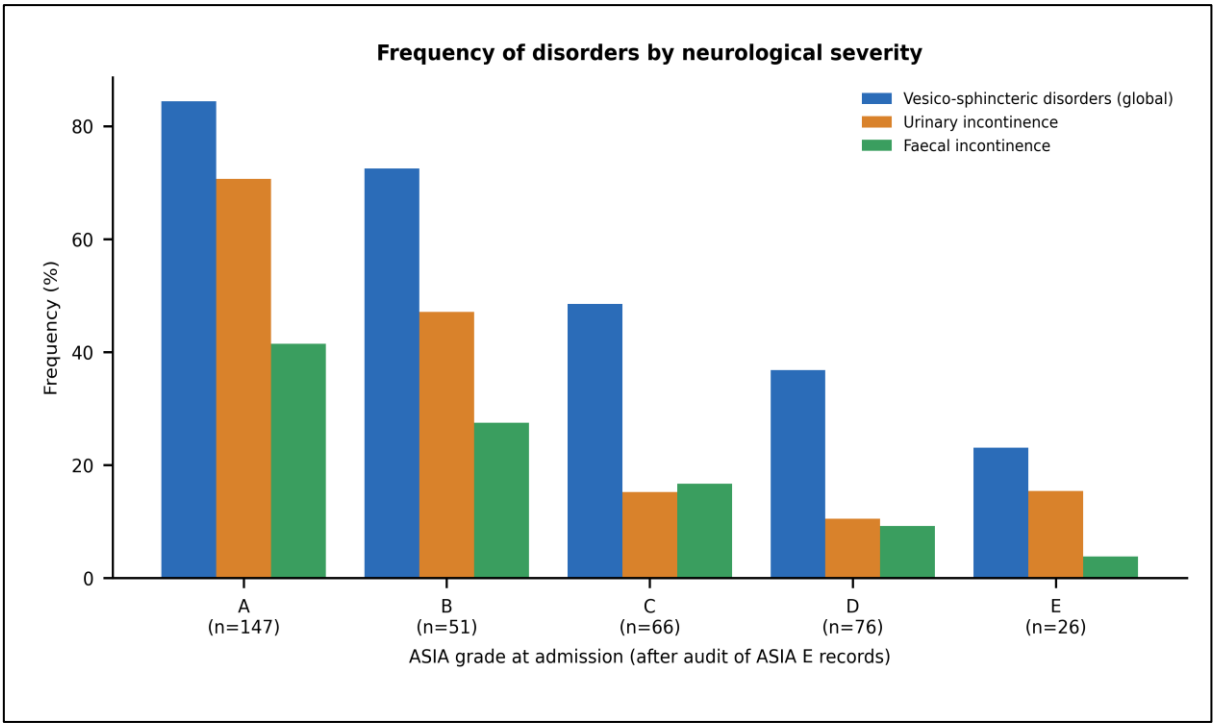


Fig 3 Prevalence of Disorders by ASIA Grade at Admission, After Audit of ASIA E Records.

Table 3 Prevalence of Vesico-Sphincteric Disorders by Lesion Level.

Segment	n	Disorders (%)	Urinary inc. (%)	Faecal inc. (%)
Cervical	183	58.5	43.2	24.0
Thoracic	124	67.7	39.5	29.8
Lumbar	48	62.5	43.8	20.8
Sacral	11	54.5	9.1	27.3

Comparison of vesico-sphincteric disorders by segment: p = 0.40 (χ^2 test). Inc.: incontinence.

➢ *Factors Associated with Vesico-Sphincteric Disorders at Admission*

In univariable analysis, two factors were associated with disorders: complete ASIA A injury (crude OR 6.07; 95% CI 3.62–10.19; p < 0.001) and male sex (crude OR 1.85; 95% CI 1.09–3.12; p = 0.030). Cervical level, spinal instability, polytrauma and age were not. In multivariable analysis, these two factors remained independent: complete ASIA A injury (adjusted OR 6.07; 95% CI 3.57–10.32; p < 0.001) and male sex (adjusted OR 2.05; 95% CI 1.15–3.67; p = 0.015). An OR of 6 does not mean six times more disorders: in absolute terms, 84.4% of complete injuries had a disorder versus 47.0% of incomplete injuries, a prevalence ratio of 1.8. The model discriminates acceptably but modestly (AUC 0.74), fits well (Hosmer-Lemeshow p = 0.36), explains little variance (Nagelkerke R^2 0.21) and shows no problematic collinearity (VIF < 5) (Table 4). We did not test an interaction between sex and complete injury. At admission, neurological severity therefore anticipates disorders better than lesion level.

Table 4 Factors Associated with the Presence of Vesico-Sphincteric Disorders at Admission (Multivariable Analysis, n = 366).

Variable	Crude OR	Adjusted OR	95% CI	p
Complete injury (ASIA A)	6.07	6.07	3.57–10.32	<0.001
Male sex	1.85	2.05	1.15–3.67	0.015
Cervical level	0.74	0.88	0.55–1.40	0.582
Spinal instability	1.34	1.18	0.71–1.97	0.528
Polytrauma	1.32	1.09	0.64–1.87	0.745
Age (per year)	1.00	0.99	0.98–1.01	0.459

n = 366; events (disorders) = 227. AUC = 0.74; Hosmer-Lemeshow p = 0.36; Nagelkerke pseudo-R^2 = 0.21; VIF < 5 for all variables. OR: odds ratio; CI: confidence interval.

➢ *Management*

Management modalities were recorded as mutually exclusive categories; percentages refer to the 227 patients with disorders. For the bladder, bladder rehabilitation came first (62 patients; 27.3%), ahead of spinal surgery, decompression or stabilisation (51; 22.5%), intermittent or self-catheterisation (50; 22.0%) and simple monitoring (40; 17.6%). An indwelling catheter was used in 20 patients (8.8%) and drug treatment (anticholinergics, alpha-blockers) in 4 (1.8%). For the bowel, 130 patients (57.3%) followed a bowel programme, with or without laxatives, and 55 (24.2%) anorectal rehabilitation; 12 (5.3%) received enemas or suppositories and 30 (13.2%) had no documented management (Table 5; Figure 4).

For sexuality, 166 patients (73.1%) had received only sexological or psychological counselling, and sexual function was not assessed in 38 (16.7%). Twenty-three patients (10.1%) had received a specialised treatment: mechanical device (17; 7.5%), drug (3; 1.3%), prosthetic surgery deferred during follow-up (3; 1.3%). We cannot cross these treatments with the 58 patients who reported a dysfunction.

Table 5 Management of Bladder, Bowel and Sexual Disorders in Patients with Disorders (n = 227).

Domain	Modality	n (%)
Urinary	Bladder rehabilitation	62 (27.3%)
	Simple voiding monitoring	40 (17.6%)
	Spinal surgery (decompression/stabilisation)	51 (22.5%)
	Intermittent catheterisation / self-catheterisation	50 (22.0%)
	Indwelling catheter	20 (8.8%)
	Medication	4 (1.8%)
Anorectal	Bowel programme (± laxatives)	130 (57.3%)
	Anorectal rehabilitation	55 (24.2%)
	No specific management	30 (13.2%)
	Enemas / suppositories	12 (5.3%)
Sexual	Sexological or psychological counselling	166 (73.1%)
	Not assessed	38 (16.7%)
	Mechanical device	17 (7.5%)
	Medication	3 (1.3%)
	Deferred prosthetic surgery (penile implant)	3 (1.3%)

Categories are mutually exclusive; percentages refer to the 227 patients with disorders. “Spinal surgery” is not a bladder-drainage modality.

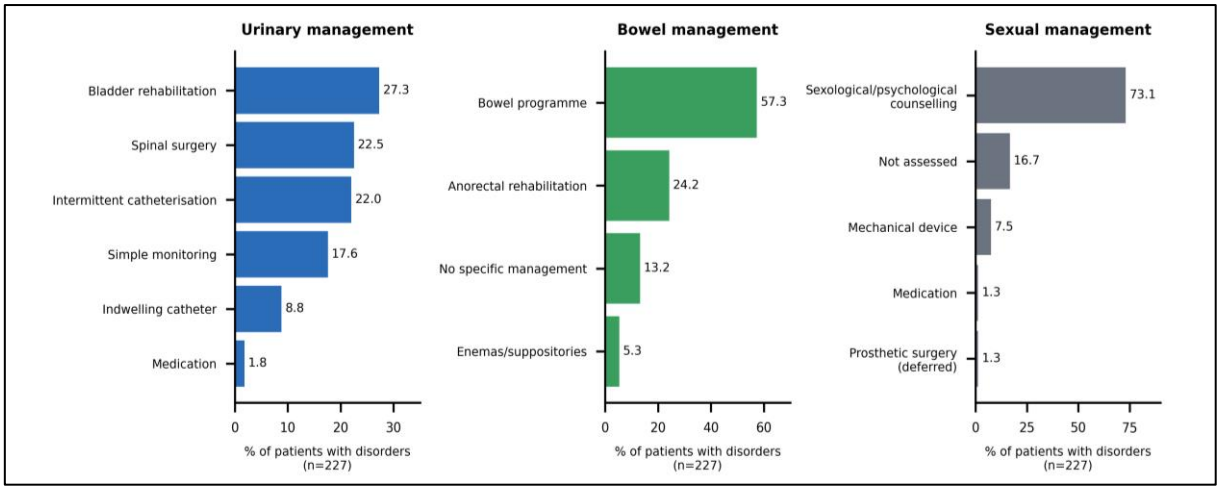


Fig 4 Management of Bladder, Bowel and Sexual Disorders (% of the 227 Patients with Disorders).

➢ *Recovery, Complications and Outcome*

Survivors were followed for a median of 45 days [IQR 14–180; range 1–365]. In-hospital mortality was 25.1% in patients with disorders (95% CI 19.9–31.1) versus 5.0% in the others (95% CI 2.5–10.0; $p < 0.001$). This crude difference depends heavily on ASIA grade. After audit of ASIA E records, deaths were distributed as follows: A 52/147 (35.4%), B 1/51 (2.0%), C 6/66 (9.1%), D 5/76 (6.6%), E 0/26 (0.0%), i.e. 64/366 (17.5%). Three of the 17 reclassified patients died (1 of the 6 reclassified to C, 2 of the 11 reclassified to D): this explains the absence of deaths in ASIA E after audit, since the three deaths initially classified E were all reclassified patients. The 52 ASIA A deaths (81.2% of deaths) and the 12 B–E deaths support the stratified analysis, which the audit does not change. In ASIA A, mortality was 47/124 (37.9%) with disorders versus 5/23 (21.7%) without (Fisher $p = 0.16$); in B–E, 10/103 (9.7%) versus 2/116 (1.7%) ($p = 0.014$). The association remained positive in both strata (Mantel-Haenszel OR 3.16; 95% CI 1.34–7.47; $p = 0.010$), versus a crude OR of 6.32. This two-group stratification is coarse. A logistic regression on ordinal ASIA grade, the presence of disorders and age confirms the association: adjusted OR 2.99 for disorders (95% CI 1.25–7.15), 2.10 per grade of severity (95% CI 1.51–2.91) and 1.03 per year of age (95% CI 1.00–1.06). These analyses are exploratory: deaths are few and intervals wide. Finally, 46 patients (12.6%) had a urinary complication during the stay, always a urinary infection; the database documents no lithiasis, obstruction or renal failure.

Among the 227 patients with disorders, 57 (25.1%) died and 170 survivors were assessable. In them, recovery remained partial at best: 66 patients (38.8%) had partial recovery, 56 (32.9%) no recovery and 48 (28.2%) persistent neurogenic bladder dysfunction. The data collection had no “complete recovery” category: the absence of complete recovery therefore reflects the classification, not the clinical picture (Table 6; Figure 5).

Table 6 Functional Vesico-Sphincteric Recovery in Survivors with Disorders at Admission (n = 170).

Functional recovery	**n (%)**
Partial recovery	66 (38.8%)
No recovery	56 (32.9%)
Persistent neurogenic bladder dysfunction	48 (28.2%)

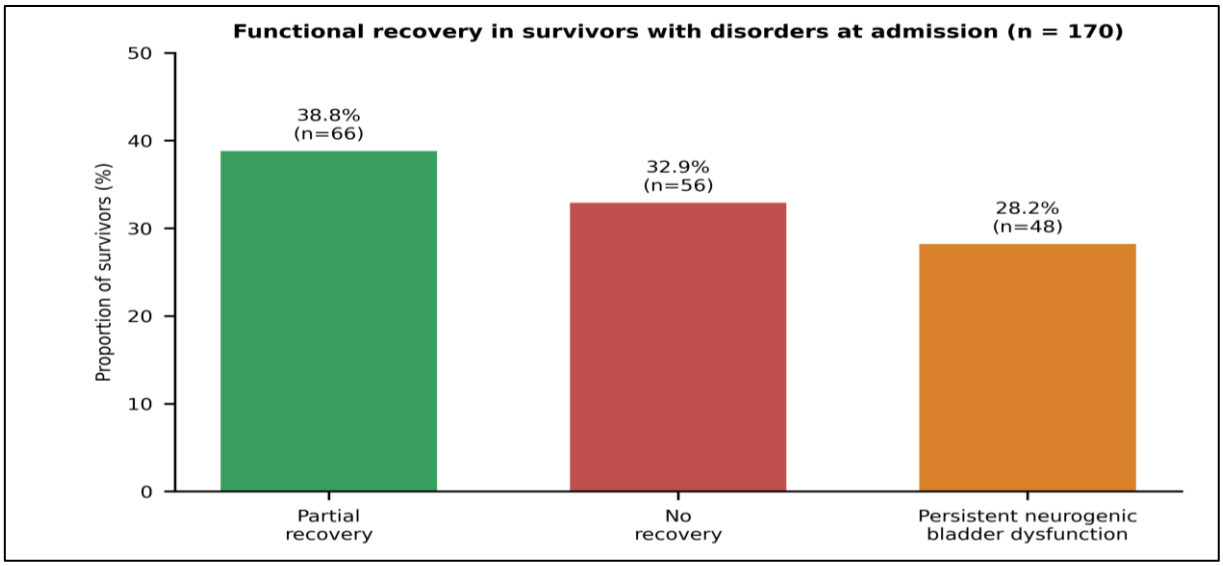


Fig 5 Functional Vesico-Sphincteric Recovery in Survivors with Disorders at Admission.

➢ *Factors Associated with Recovery*

No clinical factor was independently associated with at least partial recovery: complete ASIA A injury (adjusted OR 1.12; 95% CI 0.59–2.13), cervical level (0.91; 0.48–1.73), male sex (1.68; 0.67–4.21), early surgery ≤ 3 days (0.79; 0.39–1.61) and age (1.01; 0.99–1.03) (Table 7). Confidence intervals are wide (for example 0.59–2.13 for complete injury): the result is inconclusive and does not prove the absence of an effect.

Table 7 Factors Associated with at Least Partial Functional Recovery in the 170 Survivors with Initial Vesico-Sphincteric Disorders (Multivariable Analysis).

Variable	Adjusted OR	95% CI	p
Complete injury (ASIA A)	1.12	0.59–2.13	0.730
Cervical level	0.91	0.48–1.73	0.778
Male sex	1.68	0.67–4.21	0.269
Early surgery (≤ 3 d)	0.79	0.39–1.61	0.521
Age (per year)	1.01	0.99–1.03	0.345

n = 170; events (partial recovery) = 66. OR: odds ratio; CI: confidence interval; ASIA: American Spinal Injury Association Impairment Scale.

IV. DISCUSSIONS

In this Ivorian cohort of 366 SCI, nearly two patients in three (62.0%) had vesico-sphincteric disorders, and neurological severity strongly determined them. To our knowledge, few studies from francophone West Africa describe their prevalence, management and recovery together. Three ideas emerge: these disorders follow lesion completeness, their management lacks structure, and their limited recovery could not be predicted with the available variables.

➢ *The Disorders Follow Lesion Completeness*

A prevalence of 62.0%, dominated by urinary incontinence, matches the pathophysiology of neurogenic bladder and bowel [1,3]. It fell from 84.4% in ASIA A to 23.1% in ASIA E and did not vary with lesion level: the extent of damage matters more than its location, subject to the limited power of the comparison and to the use of the vertebral rather than the neurological level.

ASIA grade E was a problem. Before audit, 53.5% of patients classified E had the global item, whereas an ASIA E patient by definition has normal motor and sensory function, sacral function included. Audit of their records led us to reclassify 17 of the 23 patients concerned as incomplete injuries (6 to C, 11 to D), because the initial sacral examination (deep anal pressure, voluntary anal contraction) was incomplete. The 6 patients who remained E had disorders judged transient or non-neurological (painful or drug-induced retention, prior catheterisation, pre-existing urological disease). The gradient then becomes monotonic from A to E. The audit covered the 43 ASIA E patients, with or without a disorder: the 20 without a disorder were all confirmed E, which rules out misclassification linked to the presence of the disorder. The global item, defined as any documented urinary or faecal disorder, probably includes non-neurogenic or transient disorders: not all 227 patients have a neurogenic bladder, and prevalence is 57.4% without the 17 patients whose global item is isolated.

The higher mortality with disorders (25.1% vs 5.0%) is first of all a crude association, closely tied to ASIA grade: 52 of the 64 deaths concerned complete injuries. It persisted in both severity strata (ASIA A: 37.9% vs 21.7%; B–E: 9.7% vs 1.7%; Mantel-Haenszel OR 3.16; 95% CI 1.34–7.47) and in the model adjusted for ordinal ASIA grade and age (adjusted OR for disorders 2.99; 95% CI 1.25–7.15). Disorders therefore seem to carry prognostic information beyond the A versus B–E distinction, but residual confounding by severity within strata remains possible, and the analysis is exploratory. Some circularity also exists: a complete injury is defined by the absence of sacral S4–S5 function (voluntary anal contraction, deep anal pressure). Causes of death were not collected in a standardised way; no causal link can be asserted. We describe clinical disorders, not the neuro-urological dysfunction documented by urodynamics (neurogenic lower urinary tract dysfunction). The association with male sex calls for caution: it may reflect traumatic profiles or residual severity that the model does not capture, rather than an effect of sex. The ASIA grade, available at the bedside without further tests, is a tool well suited to low-resource settings.

Complete spinal cord injuries cut the descending pathways linking the pontine micturition centre to sacral centres S2–S4, which command micturition, defaecation and the reflex part of sexual function. Depending on level and completeness, the result is an areflexic bladder or, more often, detrusor overactivity with detrusor-sphincter dyssynergia, which raises bladder pressures and threatens the upper urinary tract (Figure 6) [2,16].

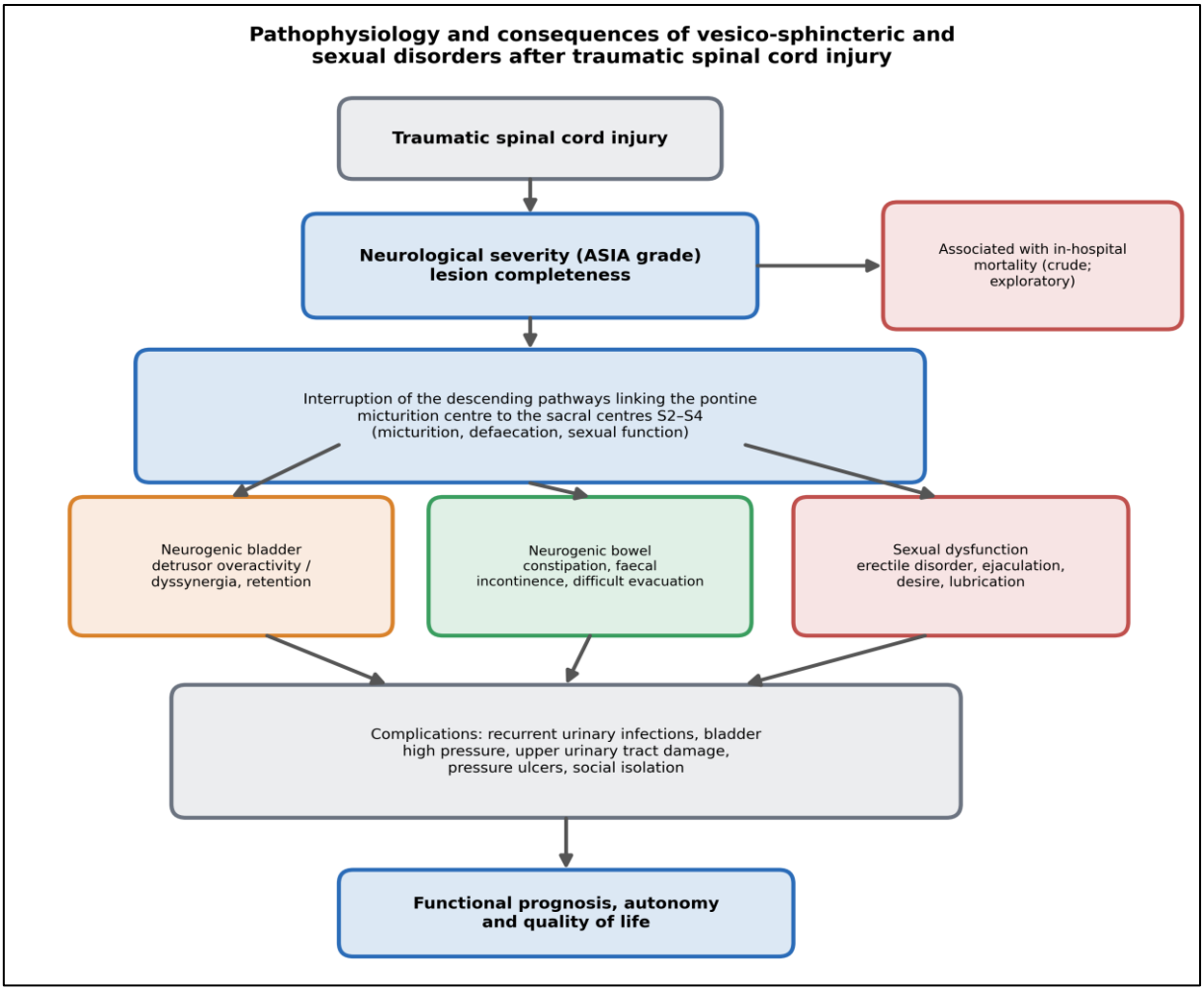


Fig 6 Pathophysiology and Functional Consequences of Disorders After SCI.

Why 62.0%? Series based on urodynamics or assessed in rehabilitation find a neurogenic bladder in 70 to 95% of patients, up to 94.65% in a Brazilian cohort from the SARAH network [17,18]. Our figure is lower, probably for three reasons: our data are clinical and collected at admission, without urodynamics to reveal subclinical dysfunction; they precede the time when some dysfunctions appear; and our tertiary-centre cohort mixes severe injuries (40.2% ASIA A) with incomplete ones. Prevalence depends on diagnostic criteria, timing of assessment, delay to care and recruitment, hence limited direct comparisons (Table 8). Because the global item covers any documented urinary or faecal disorder, 62.0% designates clinical disorders reported at admission, not an established neurogenic bladder.

Table 8 Indicative Comparison with International Cohorts.

Study	Setting	n	Prevalence / recovery
Present study	Côte d'Ivoire	366	62.0% disorders (clinical, at admission); 38.8% partial recovery (in-hospital)
Pelosi 2023	Brazil (SARAH network)	954	94.65% neurogenic bladder (traumatic + non-traumatic)
El Sammak 2023	United States (NSCIMS)	2.515	16.6% bladder recovery at 1 year
Pavese 2016 (EMSCI)	Europe (multicentre)	1.250	prediction models of continence and complete bladder emptying at 1 year (ISNCSCI, SCIM)

Definitions (clinical disorders at admission versus urodynamic neurogenic bladder or continence in rehabilitation), timing of assessment and recruitment differ between series, which limits direct comparisons. Sources: references [17–19].

And in Africa? Few African series have specifically described these disorders. Those from Cameroon, Nigeria, South Africa and East Africa mainly address epidemiology, surgery or mortality, rarely urinary, bowel and sexual function [11,20]. The difficulties we observe — single-use catheters, urodynamics, pelvic-floor rehabilitation and sexology that are hard to access — are shared by many centres in sub-Saharan Africa; our results therefore have regional relevance.

➢ *Loosely Structured Management*

Management was heterogeneous and mostly reactive. Intermittent catheterisation concerned 50 patients (22.0% of the 227 with disorders). It is the recommended

standard to protect the upper urinary tract and limit infections [8–10]. It remained a minority: bladder rehabilitation (27.3%) and spinal surgery alone (22.5%) exceeded it, and 17.6% of patients had only simple monitoring. The indwelling catheter was about two and a half times less frequent (8.8%); yet prolonged use increases the risk of bladder cancer [21]. The evolution of bladder-drainage methods has been documented over several decades in the United States [22]. For the bowel, bowel programmes and anorectal rehabilitation dominated, but 13.2% of patients had no documented strategy, although structured programmes are recommended [23,24], including drug treatment [25]. These gaps probably reflect local constraints — single-use equipment, urodynamics, pelvic physiotherapy, urological follow-up — rather than a failure of clinical recognition. Table 9 compares our observations with international recommendations (percentages of the 227 patients with disorders) and shows a large gap between neuro-urology standards and their application with few resources (care gap). We could describe urinary complications only as infections (12.6%); contemporary cohorts also document urological surgery and renal damage [26].

Table 9 Comparison Between International Recommendations and Observed Practice in Our Cohort.

Domain	International recommendation	Observations in the present study
Bladder	Clean intermittent catheterisation first-line; limit indwelling catheters; upper-tract surveillance (AUA/SUFU, EAU)	Intermittent catheterisation 22.0%; indwelling catheter 8.8%; simple monitoring 17.6% (percentages of the 227 patients with disorders)
Bowel	Early structured bowel programme (Consortium, recent reviews)	Bowel programme 57.3%; no specific management 13.2% (percentages of the 227 patients with disorders)
Sexuality	Systematic assessment (M and F) and specialist referral	Counselling only 73.1%; specialised management 10.1%; not assessed 16.7% (percentages of the 227 patients with disorders)

AUA/SUFU: American Urological Association / Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction; EAU: European Association of Urology. References [7–10,23,24].

➢ *Sexuality, the Great Forgotten*

Only 15.8% of Patients reported a sexual dysfunction; 73.1% had received counselling only and 23 patients (10.1% of the 227 with disorders) a specialised treatment. This very probably reflects under-assessment, not sparing: our figure is that of reported disorders, not true prevalence. In West Africa, sexuality remains a sensitive subject, rarely raised in hospital, which increases under-reporting. In the acute phase, pain, stress, functional limitations and sociocultural barriers hinder speech; the lack of a validated questionnaire (IIEF, FSFI, International SCI Sexual Function Data Set) and of specialists makes it worse [27,28]. We could not analyse dysfunction by sex (only 70 women). Figures by grade also cast doubt on a clinical gradient: 23.1% in ASIA A, far below the near-constancy described after complete injury, a peak in ASIA C (30.3%) and no case in ASIA D or E. Data collection probably depends on assessment. In women, lubrication, orgasm, dyspareunia, fertility, pregnancy and childbirth are very poorly documented and probably even more under-assessed; they deserve dedicated evaluation [15,29–31].

➢ *Limited Recovery that we Could not Predict*

In survivors, recovery was partial at best (38.8%), but the absence of complete recovery is not a finding: the data collection had no such category. No measured clinical factor, severity at admission and early surgery included, was associated with recovery. This null result should be read with caution: confidence intervals are wide (adjusted OR for complete injury 1.12; 95% CI 0.59–2.13) and power is limited (66 events). It is inconclusive rather than demonstrating no effect. Usual clinical variables seem insufficient; recovery probably depends on mechanisms we did not measure: true extent of the cord contusion, involvement of the conus and sacral roots, neuronal plasticity, intensity and continuity of pelvic-floor rehabilitation, secondary urological complications.

This modest recovery is not specific to our setting. A large North American cohort reports only 16.6% bladder recovery at one year [19], and European prediction models rely on standardised motor and sensory parameters rather than simple clinical signs [18]. More recent models of early prediction, such as the HALT score, have been proposed [32]. Our result echoes these difficulties [33,34] and argues for models that integrate radiological, neurophysiological and functional data. Biologically, the succession of spinal cord injury mechanisms probably explains this limited recovery: oedema, ischaemia and inflammation in the acute phase; demyelination, apoptosis and gliosis in the secondary phase; neuronal reorganisation, plasticity and fibrosis in the chronic phase. The integrity of sacral reflex circuits and the intensity of pelvic-floor rehabilitation probably play a major role that our variables do not capture.

Two limitations add to this. Spinal shock may have transiently changed signs in the acute phase, before the definitive neuro-urological profile settled. And, without urodynamics, our classification of recovery is clinical and may miss fine changes. Finally, partial recovery in only four survivors in ten suggests that many may keep chronic disorders and need prolonged neuro-urological follow-up, which the shortness of our follow-up does not allow us to assert.

➢ *Reading Through the ICF*

The International Classification of Functioning (ICF) sheds light on our results: neurological impairments limit activities (continence, autonomy) and restrict participation

(social, family, work and sexual life), especially when urinary, bowel and sexual functions are affected. Patients attach great importance to control of bladder, bowel and sexuality: therapeutic success is therefore not measured by neurological improvement alone, it must integrate the goals that patients set for themselves [5,6]. We propose a structured care pathway (Figure 7).

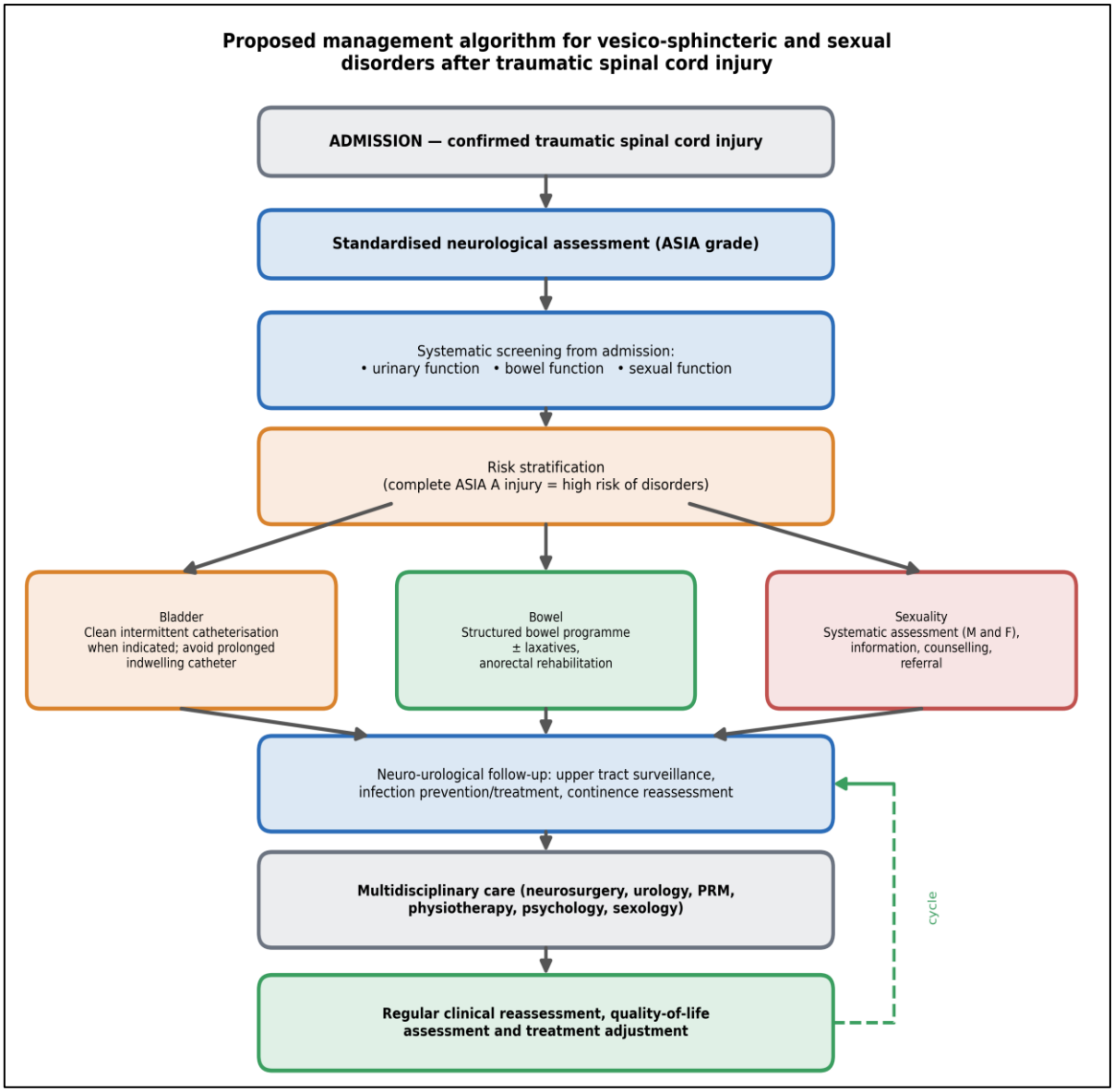


Fig 7 Proposed Management Algorithm Based on the Results of the Study.

➢ *What this Changes for Global Neurosurgery*

Spinal surgery is an essential step, but functional outcome depends just as much on rehabilitation and neuro-urological follow-up. In many sub-Saharan centres, neurosurgical teams have no permanent access to neuro-urology, urodynamics or sexology; a simple, reproducible clinical assessment such as the ASIA grade is particularly valuable there. Some difficulties are found in all SCI cohorts; others come from local constraints of organisation and access to equipment. Strengthening neuro-urology, ensuring a lasting supply of catheters, training caregivers and integrating sexual health into care pathways should be public-health priorities where SCI is frequent [35,36]. Cost also matters: neuro-urological complications lengthen hospital stay, increase the need for catheters, pads and treatments, and weigh on families when they pay most of the expenses.

➢ *Strengths*

Our strengths: the size of the cohort, the quality audit of the database, the joint analysis of prevalence, management and recovery, and the use of the ASIA grade to relate disorders to neurological severity.

V. LIMITATIONS

Our data are clinical and self-reported, without urodynamics or a validated questionnaire of sexual function (IIEF, FSFI). We may therefore have underestimated the disorders, especially in women; we cannot distinguish neurogenic bladder phenotypes (detrusor overactivity, detrusor-sphincter dyssynergia, areflexic bladder) nor assess bladder compliance, and some asymptomatic dysfunctions may have gone unnoticed. The global item, defined as any documented urinary or faecal disorder, was isolated, with no subtype, in 17 patients (prevalence 57.4% without them). Before

audit, 23 patients classified ASIA E had this global item for only 6 subtype events, which led us to audit all ASIA E patients; its clinical meaning remains to be clarified. Sexual function was not assessed in 76 patients (20.8%), who were counted as without dysfunction in comparisons by grade. A catheter placed before referral (71.9% of patients were referred) may have masked acute retention, and the time of admission was not defined by a fixed delay.

Follow-up was short (median 45 days, from 1 to 365 days, without time analysis): we mainly describe the in-hospital and early course, not the late course of functions nor chronic renal complications. The recovery model rested on few events (66 for 5 variables), which limits power to detect effects of small size. The absence of a "complete recovery" category complicates interpretation. Restricted to survivors, the analysis is exposed to survivor bias: the most severe patients are excluded. Important variables were missing: intensity of rehabilitation, socioeconomic level, adherence to care.

The single-centre and partly retrospective design exposes us to selection bias (a tertiary centre receives the most severe cases) and to missing data. The study is observational: it establishes no causal link. It also concerns the same cohort of 366 patients as other manuscripts of the series (prognostic analysis of mortality and neurological recovery; AOSpine classification). These works share the population and descriptive tables; ours focuses on vesico-sphincteric and sexual disorders, their management and their recovery. The SIBAHI 1 manuscript on genito-sphincteric disorders after SCI, which concerns a bicentric cohort of 120 patients recruited between 2019 and 2024, shares 28 patients with the present cohort; the objectives and outcomes of the two works are distinct. These limitations call for multicentre prospective studies with standardised functional assessments and neuro-urological investigations.

➢ *Applicability of the Results*

Bouaké University Hospital is the main referral centre for central Côte d'Ivoire and receives patients from several regions. The link between ASIA grade and disorders is probably generalisable; management, on the other hand, depends heavily on resources. Our results should apply to specialised centres in sub-Saharan Africa facing comparable constraints; extending them to high-income systems should remain cautious.

➢ *Research Perspectives*

A standardised prospective evaluation is now needed, with the international data sets on bladder, bowel and sexual function [37], access to urodynamics, a measure of quality of life, a validated prognostic score of recovery and evaluation of structured protocols for intermittent catheterisation and bowel management. A multicentre African SCI registry would harmonise practices and identify prognostic factors in low-resource settings.

VI. CONCLUSION

At Bouaké University Hospital, vesico-sphincteric disorders affect nearly two patients in three after an SCI, and their frequency follows neurological severity, from ASIA grade A to grade E. They are associated with in-hospital mortality, including after stratification by severity (exploratory analysis, no causal link demonstrated). Their recovery remains modest and partial, with no clinical predictor identified (inconclusive result), and sexual function remains largely under-assessed. From admission, and within the neurosurgical pathway, multidisciplinary care must therefore be organised: systematic screening, clean intermittent catheterisation, bowel programme, pelvic-floor rehabilitation, assessment of sexual health and prolonged neuro-urological follow-up, with neurosurgeons, urologists, rehabilitation physicians, physiotherapists, psychologists and sexologists. Beyond the spinal lesion, preserving urinary, bowel and sexual function, which determine autonomy and quality of life, must become a therapeutic goal in its own right and an indicator of quality of care, including in low-resource systems.

DECLARATIONS

➢ *Ethical Approval and Consent*

Study compliant with the Declaration of Helsinki, approved by the Institutional Ethics Committee of Bouaké University Hospital (CEI/CHU-BKE/140/2026). Consent waived for retrospective use of records (anonymised data); informed consent from the patient or legal representative for the prospective phase.

➢ *Consent for Publication*

Not applicable: the article publishes no identifiable individual data.

➢ *Funding*

No specific funding.

➢ *Conflicts of Interest*

The authors declare no conflicts of interest.

➢ *Data Availability*

The corresponding author can share anonymised data on reasonable request, after institutional approval and in compliance with local ethical rules.

➢ *Related Manuscripts*

This study rests on the same cohort of 366 patients as other manuscripts of the series (prognostic analysis of mortality and neurological recovery; AOSpine classification): the population and descriptive tables are shared, the objectives differ (vesico-sphincteric and sexual disorders, management, recovery). The SIBAHI 1 manuscript on genito-sphincteric disorders after SCI, which concerns a bicentric cohort of 120 patients recruited between 2019 and 2024, shares 28 patients with the present cohort; the objectives and outcomes of the two works are distinct.

➢ *Author Contributions*

All authors commented on successive versions of the manuscript and approved the submitted version.

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