

Pharmacist-Delivered Pharmaceutical Care in a Patient with Advanced HIV Disease Complicated by Acute Gastroenteritis: A Case Report Highlighting How Incomplete Antiretroviral Regimen Documentation Limits Drug-Interaction Assessment

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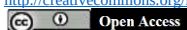
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ABSTRACT

Acute gastroenteritis in a person living with HIV who has a history of poor antiretroviral therapy (ART) adherence and unintentional weight loss is a recognised presentation of advanced HIV disease, requiring a package of opportunistic infection screening, ART re-engagement, and careful medication review. Pharmaceutical care in this setting is complicated by polypharmacy across antiretroviral, antimicrobial, antiparasitic and supportive therapies, several of which interact in ways that depend critically on precisely which antiretroviral agents a patient is taking. A 42-year-old man with a history of alcohol use disorder and poor adherence to highly active antiretroviral therapy (HAART) presented with progressive weight loss and gastroenteritis, and was investigated for advanced HIV disease (CD4 count, full blood count with differential, chest radiograph, and urine TB lipoarabinomannan). He was restarted on HAART and treated with intravenous ciprofloxacin, intravenous metronidazole, oral albendazole, cotrimoxazole, oral zinc, and intravenous fluids. Using a structured Subjective–Objective–Assessment–Plan (SOAP) pharmaceutical care workup, the clinical pharmacist identified non-adherence, a generically stated interaction between HAART and both ciprofloxacin and albendazole, and a need for immune-supportive vitamins. Independent re-appraisal for this report identified that the specific class of HAART was not recorded anywhere in the documentation — a gap that itself precludes meaningful assessment of the very interactions the original plan flagged, since the clinically relevant mechanisms in this case (cation-chelation with zinc, cytochrome P450 3A4-mediated effects on albendazole, and additive renal transporter inhibition with cotrimoxazole) each depend on whether the regimen is integrase-inhibitor-, non-nucleoside reverse-transcriptase-inhibitor-, or protease-inhibitor-based. The patient's diarrhoea improved with formation of harder stool, adherence counselling was delivered, and he remained admitted for completion of the advanced HIV disease workup at the time of documentation closure. This case illustrates that documentation completeness is itself a modifiable drug therapy problem: a pharmaceutical care plan can correctly identify that an interaction exists in principle while being unable to characterise its direction, magnitude, or management without the specific regimen recorded. We recommend that antiretroviral regimen and drug class be a mandatory, structured field in pharmaceutical care documentation for any patient living with HIV.

1. Introduction

Advanced HIV disease — defined by the World Health Organization (WHO) as a CD4 count below 200 cells/ μ L or WHO clinical stage 3 or 4 — remains a major cause of HIV-related morbidity and mortality, particularly in patients who have disengaged from antiretroviral therapy (ART).[1,2] The WHO-recommended package of care for advanced HIV disease includes systematic screening for tuberculosis (including urine lateral-flow lipoarabinomannan, TB-LAM, testing) and cryptococcal disease, co-trimoxazole preventive therapy, rapid ART initiation or re-initiation, and intensified

adherence support.[1–4] A patient presenting with progressive weight loss, poor ART adherence, and gastroenteritis — as in this case — is a textbook trigger for this package of care.

Pharmacotherapy in this setting is unusually dense: a re-initiated or continued antiretroviral regimen sits alongside empirical antimicrobial and antiparasitic therapy for gastroenteritis, opportunistic infection prophylaxis, and supportive care. Many of the clinically important interactions in this space are not class-independent — they depend on exactly which antiretroviral backbone a patient is taking. Integrase strand-transfer inhibitors (INSTIs) such as dolutegravir are highly susceptible to chelation by polyvalent cations; non-nucleoside reverse-transcriptase inhibitors (NNRTIs) such as efavirenz induce cytochrome P450 3A4 (CYP3A4) and can alter the metabolism of co-administered drugs; and ritonavir-boosted protease inhibitors (PIs) potentially inhibit CYP3A4 with the opposite effect.[5–14] A pharmaceutical care record that documents only "HAART" without specifying the regimen therefore cannot support a clinically actionable interaction assessment, however diligently the interaction is flagged in principle.

This report describes the pharmaceutical care delivered to a patient with advanced HIV disease and gastroenteritis using a structured, prospectively documented workup, and — consistent with the approach taken in our related case reports — subjects the documented medication plan to independent, current evidence-based scrutiny. The central finding of that scrutiny is itself methodological: an undocumented antiretroviral regimen class is, in our view, a drug therapy problem in its own right, because it prevents the pharmacist (or any subsequent reviewer) from resolving the very interactions the original record correctly anticipated.

2. Case Presentation

To protect confidentiality, the patient is not identified by name, hospital number, or exact calendar dates; the clinical course is presented relative to the day of admission (Day 1). Written informed consent for publication of anonymised clinical details was obtained (see Declarations).

2.1 Patient and history

A 42-year-old man working as a mechanic presented with progressive weight loss, evidenced by loosened-fitting clothing. He was married in a monogamous relationship. He had a known alcohol use disorder but did not use tobacco. He was not known to have hypertension, epilepsy, asthma, diabetes, or sickle cell disease, had no history of previous surgery, and had no known food or drug allergy. His compliance history documented poor adherence to HAART, and he had no other past medication history. He expressed satisfaction with his treatment progress so far but frustration at being unable to complete the requested investigations promptly.

2.2 Examination and investigations

On admission, vital signs were: blood pressure 110/70 mmHg, heart rate 100 beats per minute, respiratory rate 21 cycles per minute, and temperature 37.1 °C. Advanced HIV disease work-up was initiated, comprising CD4 count, full blood count with differential, chest radiograph, and urine TB-LAM testing; at the point of pharmaceutical care documentation, these investigations were still pending.

2.3 Diagnosis and initial treatment

A diagnosis of retroviral disease (HIV) with gastroenteritis was made. The patient was restarted on HAART — the specific regimen and drug class were not recorded in the pharmaceutical care documentation — alongside intravenous metronidazole 500 mg eight-hourly for five days, intramuscular paracetamol 600 mg eight-hourly for 24 hours, oral cotrimoxazole 960 mg daily for seven days, oral zinc 200 mg daily for seven days, intravenous ciprofloxacin 200 mg twelve-hourly for five days, oral albendazole 400 mg daily for three days, and intravenous fluids (normal saline alternating with 5% dextrose saline, 1 L twelve-hourly). Table 1 summarises the baseline clinical characteristics.

Table 1. Baseline patient and clinical characteristics



Parameter	Finding
Age / sex	42 years / male
Occupation	Mechanic
Diagnosis	Retroviral disease (HIV) with gastroenteritis
Presenting complaint	Progressive weight loss (loosened-fitting clothing)
Family history	Married, monogamous relationship
Social history	Known alcohol use disorder; no tobacco use
Past medical history	No known hypertension, epilepsy, asthma, diabetes, or sickle cell disease; no prior surgery; no known drug or food allergy
Compliance history	Poor adherence to HAART
Vital signs on admission	BP 110/70 mmHg; HR 100 bpm; RR 21 cpm; temperature 37.1 °C
Investigations requested (pending)	CD4 count; full blood count with differential; chest radiograph; urine TB-LAM

3. The Pharmaceutical Care Workup

Pharmaceutical care was delivered using a structured, prospective workup consistent with the Subjective–Objective–Assessment–Plan (SOAP) documentation model and the pharmacotherapy-workup framework described by Cipolle, Strand and Morley.[15] Drug therapy problems were classified using the Pharmaceutical Care Network Europe (PCNE) Classification for Drug-Related Problems, version 9.1.[16] The workup comprised structured data collection (history, medication reconciliation, vital signs), a problem list distinguishing medication-related, disease-related and lifestyle-related problems, a documented plan for each identified problem, and follow-up review of the medication administration record through to the point of writing.

As in our related case reports, an additional step was undertaken for this report: each medication and each documented concern was independently re-examined against current interaction databases (including the University of Liverpool HIV Drug Interactions resource) and the published literature, so that the discussion below both reports what was done and evaluates whether the documentation, as recorded, was sufficient to support it.

4. Assessment: Drug Therapy Problems Identified

The original pharmaceutical care documentation identified three problems: non-adherence to HAART, a generically stated drug–drug interaction between HAART and both ciprofloxacin and albendazole, and a need for additional vitamin therapy to support immune function. Independent re-review for this report identified three further points, summarised together in Table 2.

Table 2. Drug therapy problems identified, classified using the PCNE V9.1 framework

No.	Drug therapy problem	Clinical significance	PCNE domain
1	Non-adherence to HAART (as originally documented)	Poor ART adherence is strongly associated with virological failure, disease progression, and — as in this case — presentations consistent with advanced HIV disease.[17–20]	Effectiveness — non-adherence
2	Documentation gap: HAART regimen/drug class not recorded (identified on independent re-review)	The specific interactions between HAART and zinc, cotrimoxazole, and albendazole all depend on antiretroviral class (INSTI vs NNRTI vs boosted PI); without this recorded, the interactions flagged in the original plan cannot be resolved or safely managed.[5–14]	Other — incomplete documentation
3	Possible chelation interaction: HAART + zinc, if regimen is integrase-inhibitor-based (not flagged in the original documentation)	Di- and trivalent cations, including zinc, chelate integrase inhibitors such as dolutegravir in the gastrointestinal tract, reducing their absorption and risking subtherapeutic antiretroviral exposure.[5–9]	Safety/effectiveness — drug interaction (conditional)
4	Possible additive renal transporter inhibition: HAART + cotrimoxazole, if regimen is integrase-inhibitor-based (identified on independent re-review)	Both dolutegravir and the trimethoprim component of cotrimoxazole inhibit renal creatinine transporters (OCT2/MATE), which can produce an additive, benign rise in serum creatinine that should not be mistaken for true glomerular injury.[10–14]	Safety — pharmacokinetic interaction (conditional; monitoring)
5	Need for additional therapy: immune-supportive vitamins (as originally documented)	Reasonable supportive-care intent in a patient with weight loss and probable micronutrient depletion; the specific formulation and evidence base were not detailed in the original record.	Effectiveness — additional therapy needed
6	Lifestyle-related problem: alcohol use disorder as an unaddressed contributor to non-adherence (identified on independent re-review)	Alcohol use is one of the most consistently identified, modifiable predictors of ART non-adherence, with pooled analyses reporting roughly double the odds of non-adherence among people who drink.[17–20]	Lifestyle-related problem

5. Plan: Interventions and Evidence-Based Rationale

5.1 The central problem: an undocumented antiretroviral regimen

The most important finding of this report is procedural rather than pharmacological. The original documentation correctly flagged "potential interaction between HAART and some drugs like ciprofloxacin, albendazole" — but without recording which antiretroviral agents the patient was taking, this flag cannot be converted into a specific, actionable recommendation. The three most plausible interaction mechanisms in this case point in different directions depending on regimen: if the patient's HAART includes an integrase inhibitor such as dolutegravir (the WHO-preferred first-line backbone in most high-burden settings), the clinically relevant risk is chelation by co-administered zinc and, separately, additive renal transporter inhibition with cotrimoxazole; if the regimen includes efavirenz (an older but still widely used NNRTI) or a ritonavir-boosted protease inhibitor, the relevant risk is altered CYP3A4-mediated metabolism of albendazole, in opposite directions for inducers versus inhibitors.[5–14] None of these can be assessed, and none of the corresponding monitoring or dose-timing advice can be given, without the regimen recorded. We recommend, as a direct and generalisable

outcome of this case, that antiretroviral regimen and drug class be a mandatory, structured field in any pharmaceutical care documentation form used for patients living with HIV, rather than free text permitting entries such as "HAART" alone.

5.2 Ciprofloxacin and zinc: a route-dependent interaction

Fluoroquinolones, including ciprofloxacin, are well documented to chelate with polyvalent cations such as calcium, magnesium, iron, and zinc in the gastrointestinal tract, reducing oral bioavailability by up to 90% in some studies.[8,9] In this case, however, ciprofloxacin was administered intravenously, which bypasses gastrointestinal absorption entirely; the chelation interaction with oral zinc is therefore not clinically relevant for this course of treatment. This is a useful point for medication reconciliation at any future transition to oral therapy: if ciprofloxacin (or another oral fluoroquinolone) is prescribed orally later in this patient's care, administration should be separated from zinc and other polyvalent cation-containing products by at least two hours before or four to six hours after dosing.[8,9]

5.3 Zinc and antiretroviral therapy: a conditional but genuine interaction

If the patient's HAART regimen includes an integrase inhibitor, oral zinc could meaningfully reduce antiretroviral drug exposure through the same chelation mechanism, with dolutegravir studies showing area-under-the-curve reductions of roughly one-third to one-half with co-administered polyvalent cations under fasting conditions.[5–7] Current prescribing guidance recommends administering integrase inhibitors together with food when co-administered with calcium- or iron-containing supplements, or otherwise separating dosing by two hours before or six hours after the cation-containing product; equivalent caution is reasonable for zinc.[5–7] Because the regimen was not specified in this patient's documentation, the pharmacist could not confirm whether this precaution was needed, and the recommendation arising from this report is that it be checked and, if applicable, implemented before discharge.

5.4 Albendazole and antiretroviral therapy: a class-dependent interaction

Albendazole's active metabolite, albendazole sulfoxide, is formed via CYP3A4. Efavirenz, a CYP3A4 inducer, could reduce albendazole sulfoxide exposure, though the clinical significance of this specific interaction is considered uncertain because albendazole's antihelminthic action against luminal intestinal parasites is thought to be predominantly local rather than dependent on systemic exposure; the interaction is more likely to matter if albendazole is being used for systemic or tissue-invasive parasitic disease.[9,10] Conversely, ritonavir-boosted protease inhibitors have been shown to significantly reduce albendazole and albendazole sulfoxide exposure with prolonged co-administration, through induction of other metabolising pathways.[13,14] In either case, the three-day albendazole course used here for presumed intestinal parasitic infection is unlikely to be materially compromised, but this judgement again depends on knowing the antiretroviral class, reinforcing the recommendation in Section 5.1.

5.5 Cotrimoxazole, trimethoprim, and renal function monitoring

The trimethoprim component of cotrimoxazole is a recognised inhibitor of renal creatinine transport (via OCT2 and MATE2-K), producing a modest, reversible rise in serum creatinine that reflects reduced tubular secretion rather than true reduction in glomerular filtration.[11,12] Dolutegravir produces a very similar, mechanistically related effect via OCT2 inhibition.[10,11] If this patient's regimen includes dolutegravir, the two effects could be additive, and any rise in serum creatinine during this admission should be interpreted with this in mind rather than assumed to reflect renal injury — though genuine renal impairment should still be excluded on clinical grounds, particularly given the patient's gastroenteritis-associated fluid losses. Cotrimoxazole is additionally a recognised, guideline-endorsed component of opportunistic infection prophylaxis in advanced HIV disease; its use here is appropriate irrespective of the antiretroviral class, and if intended as ongoing preventive therapy (rather

than the seven-day treatment course as documented) it should be continued beyond discharge in line with WHO guidance.[1–4]

5.6 Addressing alcohol use disorder as a driver of non-adherence

The patient's alcohol use disorder was documented in his social history but was not linked, in the original assessment, to his separately documented non-adherence — despite alcohol use being one of the most consistently reported, modifiable predictors of ART non-adherence in the literature. A meta-analysis of studies from sub-Saharan Africa found that people who use alcohol have roughly double the odds of ART non-adherence compared with those who do not, and an earlier meta-analysis across settings found that drinkers were 40–50% less likely to be adherent than non-drinkers, with problem drinkers affected more severely still.[17–20] The recommendation arising from this report is that adherence counselling in this patient explicitly address alcohol use — for example through brief intervention or referral to alcohol-focused support alongside standard ART adherence counselling — rather than treating the two as unrelated problems, since intervening on alcohol use is itself a recognised route to improving adherence.[17–20]

5.7 Zinc for gastroenteritis in an adult patient

Zinc supplementation for acute diarrhoea has the strongest evidence base in children, where it is a WHO/UNICEF-endorsed treatment shown to reduce stool frequency, stool volume, and diarrhoeal duration.[21,22] Evidence in adults is more limited but not absent: a randomised controlled trial in hospitalised adult patients with acute diarrhoea found that zinc supplementation significantly reduced the duration of diarrhoea and associated nausea compared with placebo.[23] On this basis, the continuation of zinc in this adult patient is reasonably, if not as strongly, evidence-supported, and is a defensible adjunct provided the chelation interaction discussed in Section 5.3 is checked against his actual antiretroviral regimen.

6. Outcome and Follow-Up

At the point of pharmaceutical care documentation, the patient remained admitted, with clinical improvement evidenced by the formation of harder stool. Adherence and follow-up counselling regarding antiretroviral medication was reinforced, and the patient was noted to be satisfied with his treatment progress overall, while frustrated at delays in completing his advanced HIV disease investigations. The plan on record was to continue reassessment of adherence and tolerance to both antiretroviral and antibiotic therapy as the CD4 count, full blood count, chest radiograph, and TB-LAM results became available.

7. Discussion

This case illustrates a subtler but, in our view, equally important category of drug therapy problem alongside the more familiar ones (non-adherence, drug interactions, additional therapy needs): the drug therapy problem created by incomplete documentation itself. The original pharmaceutical care record correctly recognised that HAART could interact with ciprofloxacin and albendazole, which shows appropriate clinical vigilance. However, none of the three antiretroviral drug classes in common use interact with these agents through the same mechanism or in the same direction, so a generic flag, without the regimen recorded, cannot be converted into a specific management plan — it cannot tell the next clinician whether to separate dosing, monitor renal function, adjust an albendazole course, or do nothing at all.[5–14]

This matters practically as well as academically. Had this patient's regimen been recorded as dolutegravir-based, for example, the pharmacist could have made a specific, high-value recommendation: separate zinc dosing from HAART by several hours, and interpret any creatinine rise in light of dolutegravir's known OCT2 effect rather than escalating to a nephrology referral. Had it been efavirenz-based, the relevant point would instead have been to consider whether albendazole dosing

needed adjustment for systemic (rather than purely luminal) parasitic disease. Both are genuinely useful, low-cost interventions that were simply unavailable to the pharmacist in this case because of a documentation gap — one that, unlike most drug therapy problems, is entirely preventable by a structural change to how pharmaceutical care forms are designed.[15,16]

A second, related theme is the separation of the patient's two documented problems — non-adherence and alcohol use disorder — that the wider literature treats as strongly linked. Alcohol use is not merely a comorbid social factor in this case; it is one of the best-evidenced, modifiable predictors of the very non-adherence that brought this patient to hospital with advanced HIV disease, and addressing it is itself an adherence intervention.[17–20]

7.1 Limitations

As a single case report, these findings cannot be generalised, and — since the antiretroviral regimen was genuinely not recorded — several of the interaction discussions in this report are necessarily conditional ("if the regimen is X, then...") rather than a confirmed assessment of this patient's actual risk. This conditionality is not a weakness of the analysis; it is the central finding being reported. No CD4, TB-LAM, or chest radiograph results were available at the time of writing, limiting assessment of the severity of this patient's advanced HIV disease and the urgency of some of the interactions discussed.

7.2 Implications for practice

We recommend three concrete changes arising from this case: first, that antiretroviral regimen and drug class be a mandatory, structured (not free-text) field in pharmaceutical care documentation for people living with HIV; second, that non-adherence and alcohol use be assessed and documented as linked, rather than separate, problems when both are present; and third, that advanced HIV disease work-up in resource-appropriate settings include cryptococcal antigen screening alongside the CD4 count, TB-LAM, and chest radiograph already requested here, consistent with the WHO package of care, since this patient's presentation (weight loss, poor adherence, unknown CD4 status) meets the threshold at which such screening is recommended.[1–4]

8. Conclusion

A structured, prospectively applied pharmaceutical care workup enabled clear identification of non-adherence and a general awareness of potential drug interactions in a patient with advanced HIV disease and gastroenteritis. Independent, evidence-based re-appraisal for this report showed that the single most consequential drug therapy problem in this case was not any one interaction but the absence of a recorded antiretroviral regimen — a gap that prevented the correctly identified interaction concerns from being resolved into safe, specific, actionable advice, and that highlights documentation completeness as a distinct and directly modifiable target for pharmaceutical care quality improvement in HIV practice.

Declarations

Ethics approval and consent to participate

This report describes routine clinical pharmaceutical care and did not involve any deviation from standard practice or any research intervention; as such it was managed under the reporting institution's standard case-report/audit policy. [Insert local ethics committee name/reference or exemption statement as applicable.]

Consent for publication

Written informed consent was obtained from the patient for publication of this anonymised case report and accompanying clinical details. All potentially identifying information — including name, exact hospital number, and calendar dates — has been removed or generalised (presented as relative

admission days) to protect patient confidentiality. A copy of the consent is available from the corresponding author on request, in accordance with journal policy.

Availability of data and materials

The de-identified pharmaceutical care documentation underlying this report is available from the corresponding author on reasonable request.

Competing interests

The author declares no competing interests.

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Author contributions

O.B.E provided clinical pharmaceutical care, collected and de-identified the case data, conducted the independent evidence re-appraisal, conceived the report, and drafted the manuscript. P.E and V.N.B supervised the pharmaceutical care process and critically reviewed the manuscript. T.F.B provided the clinical care described, verified the accuracy of clinical details, and critically reviewed the manuscript. All authors approved the final version.

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