

## CASE REPORT

# Look-alikes, sound-alikes: Three cases of insidious medication errors

Johannes Heck<sup>1</sup>  | Adrian Groh<sup>2</sup> | Dirk O. Stichtenoth<sup>1,3</sup> | Stefan Bleich<sup>2</sup> | Olaf Krause<sup>4</sup>

<sup>1</sup>Institute for Clinical Pharmacology, Hannover Medical School, Hannover, Germany

<sup>2</sup>Department for Psychiatry, Social Psychiatry and Psychotherapy, Hannover Medical School, Hannover, Germany

<sup>3</sup>Drug Commissioner of Hannover Medical School, Hannover, Germany

<sup>4</sup>Institute for General Medicine, Hannover Medical School, Hannover, Germany

## Correspondence

Johannes Heck, Institute for Clinical Pharmacology, Hannover Medical School, Carl-Neuberg-Str. 1, 30625 Hannover, Germany.  
Email: heck.johannes@mh-hannover.de

## Abstract

Physicians should be aware of look-alike/sound-alike (LASA) drug names. Clearly legible drug prescriptions, preferably via electronic drug prescription systems, and the use of Tall Man lettering may help to prevent LASA medication errors.

## KEYWORDS

geriatric medicine, pharmacology, psychiatry

## 1 | INTRODUCTION

Medication errors represent a threat to patient safety<sup>1</sup> and comprise administration of a drug to the wrong patient, choice of the wrong route of administration, application of a drug at the wrong time, and administration of the wrong drug.<sup>2</sup> Administration of the wrong drug may originate from confusion of similarly looking and/or sounding drug names, for example, hydroxyzine and hydralazine.<sup>3</sup> In this article, we investigate three cases in which confusion of look-alike/sound-alike (LASA) drug names triggered medication errors with quite distinct outcomes.

## 2 | CASE 1

An 80-year-old woman (referred to as patient 1) was admitted to the gerontopsychiatric ward of our university hospital

via the emergency room due to the acute exacerbation of a recurrent major depressive disorder with psychotic symptoms. Somatic comorbidities comprised atrial fibrillation, arterial hypertension (with recurrent hypertensive crises in the past), peripheral arterial occlusive disease, third-degree atrioventricular block (implantation of a cardiac pacemaker had occurred 7 months previously), and type 2 diabetes mellitus. The patient's medication consisted of clopidogrel, ramipril, amlodipine, metoprolol extended release (ER), urapidil ER, metformin, simvastatin, melperone, and insulin glargine, and was copied into the paper-based hospital medication chart by the ward physician in a clearly legible manner (Figure 1). Nevertheless, 75 mg of clozapine were dispensed instead of 75 mg of clopidogrel.

Soon after the erroneous intake of clozapine instead of clopidogrel, patient 1 was found sitting unconsciously in a chair on the ward floor. The ward physician noted a score of

Johannes Heck and Adrian Groh have contributed equally to this work.

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Dat.	Zeit	Visite / Verordnungen
11.12.		<del>Aufwachen Propylthiouracil + Ca<sup>2+</sup> Vit B12, Vit D, Folate, 75 mg H<sub>2</sub>O, 73/74/ Dild B12 + H<sub>2</sub>B12 Risperidol in mg 0,5-0-0,5 <del>Clopidogrel 75 mg 1-0-0</del></del>
		Clopidogrel 75 mg 1-0-0
		Ramipril 5 mg 1-0-1
		Amlodipin 5 mg 1-0-1
		Metoprolol 47,5 mg 1-0-1
		Urapidil ret. 30 mg 1-0-1
		Metformin 1000 mg 1-0-1
		Simvastatin 20 mg 0-0-1
		<del>Risperidol 1 mg 0-0-0,5</del>
		Melperon 50 mg 0-0-1
		Lantus S.c. 12 0-0-4
12.12.		Risperidol 0

**FIGURE 1** Drug prescription for patient 1 upon admission to a gerontopsychiatric ward. The German words *Dat.*, *Zeit*, *Visite*, and *Verordnungen* translate to “date,” “time,” “visit,” and “prescriptions,” respectively. The physician's handwritten prescription of *Clopidogrel* 75 mg 1-0-0 is clearly legible. Nevertheless, 75 mg of clozapine were dispensed in lieu of 75 mg of clopidogrel.

only 5 on the Glasgow Coma Scale (reference value: 15) and therefore immediately initiated a computed tomography (CT) scan of the head in order to exclude an acute cranial event. The CT scan did not demonstrate an acute central nervous system pathology. Subsequently, the patient was transferred to the intensive care unit (ICU) for monitoring and further diagnostics. Upon arrival at the ICU, the patient's condition spontaneously improved without specific intervention, that is, the patient was becoming increasingly conscious and responsive. An elevated procalcitonin (PCT) level was noted (49.5 µg/L; reference value: < 0.005 µg/L), but without clinical signs of an active infection. The patient was hence transferred from the ICU to the intermediate care unit where an empiric antibiotic treatment with piperacillin-tazobactam was initiated. The subsequent day, the PCT value was decreasing, and neither chest X-ray examination nor urinalysis did reveal signs of an active infection. Since the patient was feeling significantly better, the antibiotic treatment was discontinued and the patient was transferred back to the gerontopsychiatric ward, where treatment of her psychiatric disorder was resumed.

The medication error (confusion of clopidogrel with clozapine) that had most likely triggered the calamitous cascade of events was recognized shortly after the patient had

been transferred to the ICU by means of a medication chart review of the ward physician together with the nursing staff. The nurse who had dispensed clozapine realized that—being under time pressure at her noisy workplace—she had rather “skimmed” through the medication prescription rather than read it thoroughly. She admitted that she had probably read only the first three letters of the drug name (*Clo*—) and then “jumped” immediately to the dosage (75 mg 1-0-0) (Figure 1). Since psychopharmaceuticals are dispensed far more often than other drug classes on the respective gerontopsychiatric ward, the nurse had probably been “primed” on clozapine rather than clopidogrel, leading to the life-threatening confusion of the platelet aggregation inhibitor clopidogrel with the second-generation antipsychotic clozapine. Fortunately, patient 1 survived this hazardous episode which included an ICU stay. Patient 1 recovered without sequelae and was able to resume treatment of her psychiatric condition.

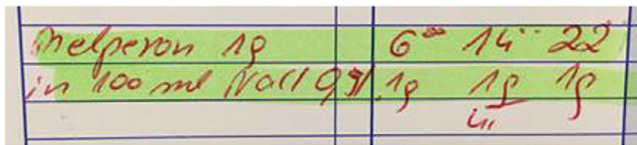
### 3 | CASE 2

A 79-year-old woman (referred to as patient 2) was admitted to the gerontopsychiatric ward of our university hospital via the emergency room because of an alcohol intoxication in conjunction with acute suicidality. Patient 2 had been suffering from alcohol dependence and depression for many years and was regularly consuming alcohol at her nursing home. Comorbidities encompassed atrial fibrillation, dementia, hypothyreosis, and osteoporosis. Upon admission to the gerontopsychiatric ward, the patient was monitored clinically but since she did not display alcohol withdrawal symptoms, no specific pharmacological treatment was necessary. The subsequent day, patient 2 stated that she could not recollect the events that had led to her hospital admission and clearly distanced herself from suicidal ideation. She felt sorry for what had happened, was friendly and cooperative, and kindly asked to be released from hospital. After consultation of her legal guardian who did not express any concerns, patient 2 was discharged from hospital and transferred back to her nursing home. During the brief hospital stay, her medication was not altered. However, the medication list, which was integrated into her discharge letter, did contain a potentially perilous spelling mistake (Figure 2), as was only later recognized during a routine medication chart review by the department's consultative clinical pharmacologist. The direct oral anticoagulant edoxaban (German spelling: *Edoxaban*) was erroneously spelled *Endoxaban* [sic], bearing high confusion potential with the antineoplastic/immunosuppressive agent Endoxan® (cyclophosphamide). The patient's primary care physician was contacted and informed about this potentially hazardous error. Thus, serious harm could fortunately be averted.

**Medikationsvorschlag:**

Präparat®	Morgen	Mittag	Abend	Nacht	Bemerkung
Citalopram 10mg	1	0	0	0	
Metoprolol ret. 47,5mg	1	0	0	0	
L-Tyroxin 25µg	1	0	0	0	
Calcilac 500/400 IE	1	0	0	0	
Endoxaban 30mg	1	0	0	0	
Novaminsulfon 500mg	1	0	1	0	

**FIGURE 2** Medication chart of patient 2 as part of her discharge letter from hospital. The German words *Medikationsvorschlag*, *Präparat*, *Morgen*, *Mittag*, *Abend*, *Nacht*, and *Bemerkung* translate to “medication proposal,” “drug,” “morning,” “noon,” “evening,” “night,” and “comment,” respectively. Whereas the typo in *L-Tyroxin* (correct German spelling: *L-Thyroxin*) and the omission of the unit “mg” after the number 500 in *Calcilac 500/400 IE* appear rather innocuous, the spelling mistake in *Endoxaban* [sic] could lead to a hazardous confusion of the direct oral anticoagulant edoxaban (in German: *Edoxaban*) with the antineoplastic/immunosuppressive agent Endoxan® (cyclophosphamide).



**FIGURE 3** Drug prescription for patient 3. Due to a transcription error, the antibiotic Meronem® (meropenem) was confused with the low-potency first-generation antipsychotic melperone, highlighted in green. The comedication of patient 3 consisted of ramipril, bisoprolol, prednisolone, methotrexate, folic acid, pantoprazole, mirtazapine, pipamperone, trimethoprim-sulfamethoxazole, and tinzaparin.

## 4 | CASE 3

A 91-year-old woman (referred to as patient 3) was admitted to the department for trauma surgery of our university hospital via the emergency room. The patient was suffering from dementia and had fallen on her right elbow while walking around in her nursing home at night. X-ray examination revealed a fracture of her right olecranon which was treated surgically. During the hospital stay, the patient developed a urinary tract infection with multiresistant *Escherichia coli*. Taking into account the respective antibiogram, the surgeon prescribed Meronem® (meropenem) 1 g intravenously three times a day at 6:00 AM, 2:00 PM, and 10:00 PM, respectively. However, when the prescription was copied into the actual medication chart, a transcription error occurred, leading to the faulty instruction of *Melperon 1 g 6<sup>00</sup>-14<sup>00</sup>-22<sup>00</sup>* (Figure 3). During an interdisciplinary orthogeriatric ward round (the procedure of which we have recently described),<sup>4</sup> this medication error (confusion of the antibiotic Meronem® with the low-potency first-generation antipsychotic melperone) was identified by the department's consultative geriatrician. Fortunately, the error was detected and rectified before the wrong drug was administered. Thus, a potentially lethal outcome could be prevented.

## 5 | DISCUSSION

The presented cases demonstrate that LASA medication errors may have various causes. In case 1, the medication

error (confusion of clopidogrel with clozapine) most likely originated from preparation of the medication under time pressure in a distracting working environment. Additionally, the nurse's expectation of reading the name of a psychopharmaceutical instead of a platelet aggregation inhibitor may have contributed to the confusion of the drugs. In case 2, the (potential) medication error was probably caused by an imprecise and “sloppy” prescription behavior. Figure 2 demonstrates that besides the spelling error in *Endoxaban* [sic] *L-Tyroxin* [sic] was spelled erroneously (correct German spelling: *L-Thyroxin*), and the unit (mg) was omitted after the number 500 in *Calcilac 500/400 IE*, amounting to a total of 3 errors in 6 prescribed drugs. In case 3, the medication error resulted from a faulty transcription from the prescription chart to the medication chart (two separate sheets of paper). In contrast to meropenem, an intravenous preparation of melperone does not exist in Germany. Melperone is available as tablets and as a fluid preparation for p.o. administration, containing 5 mg of melperone per mL of fluid.<sup>5</sup> Two scenarios are conceivable in which melperone might have been administered in lieu of meropenem. First, melperone might have been applied orally since the respective entry in the medication chart (*Melperon 1 g 6<sup>00</sup>-14<sup>00</sup>-22<sup>00</sup>*) did not specify the route of administration (Figure 3). Second, it may be speculated that under extremely unfortunate circumstances, an inexperienced nurse or a trainee might have solved 200 mL of melperone fluid (corresponding to 1 g of melperone) in 100 mL of sodium chloride 0.9% solution (as indicated in Figure 3) and might have administered this “preparation” intravenously to patient 3. Both scenarios would have caused a tremendous overdose of melperone and would have likely resulted in the death of patient 3.

In case 1, the medication error was identified by means of an internal team meeting and interprofessional medication chart review. In cases 2 and 3, the medication errors were revealed by external consultative physicians during interdisciplinary ward rounds. This suggests that internal quality management measures such as regular team meetings taking place in a concentrated working atmosphere

without distractions and without undue time pressure may disclose (medication) errors and other threats to patient safety. Furthermore, consultation of external specialists may help to identify medication errors<sup>4</sup> and avoid potentially disastrous outcomes.

In order to minimize the risk of medication errors due to LASA drug names, the concept of Tall Man lettering, that is, capitalizing parts of a drug name, has been proposed.<sup>3,6,7</sup> Unfortunately, neither the United States Federal Drug Administration (FDA) nor the Institute for Safe Medication Practices (ISMP) have recommended a Tall Man letter notation for clopidogrel, which might have been useful to prevent the medication error in case 1. However, the ISMP has published rules of how to create Tall Man letter notations of drugs in general.<sup>6</sup> Application of these rules to clopidogrel would yield the notation “cloPIDOgrel” (in German: *CloPIDOgrel*). Even though we cannot be sure that Tall Man lettering would have definitely prevented the confusion of clopidogrel with clozapine in case 1, we have recommended to our fellow physicians to consider prescribing these two drugs in the future in Tall Man letters: *CloPIDOgrel* and *CloZAPin*, respectively.<sup>6</sup> Another strategy to avoid LASA medication errors may be the specification of the indication for which a certain drug is prescribed. In case 1, the physician might have written: “clopidogrel (for platelet inhibition) 75 mg 1-0-0” (in German: *Clopidogrel (zur Blutplättchenhemmung) 75 mg 1-0-0*).

In summary, the presented cases highlight that LASA medication errors may originate from a plethora of causes: preparation of patients' medication under time pressure and/or in a distracting working environment, nonuse of Tall Man lettering, carelessness during preparation of medication charts and discharge letters, and use of error-prone paper-based prescription/medication charts. These risk factors for LASA medication errors may be attenuated by respective countermeasures, that is, preparation of patients' medication in a quiet, nondistracting working environment,<sup>2</sup> use of Tall Man lettering<sup>6</sup> whenever confusion of LASA drug names may be looming, meticulous preparation of medication charts and careful review of discharge letters before dispatch, and prescription of drugs only in a clearly legible manner, preferably via electronic drug prescription systems.<sup>2</sup>

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## CONFLICT OF INTEREST

None declared.

## AUTHOR CONTRIBUTIONS

JH, AG, and OK: writing the first draft of manuscript. SB and DOS: commented on previous versions of the manuscript. DOS: supervised the project. All authors: read and approved the final manuscript.

## ETHICS STATEMENT

Written informed consent for patient information to be published was provided by all patients or a legally authorized representative.

## DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

## ORCID

Johannes Heck  <https://orcid.org/0000-0002-5382-3014>

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