

# Are You Really Dead? Validation of Death and Date of Death in Patients With COPD in the CPRD

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## DISCLOSURES

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## BACKGROUND

The current Clinical Practice Research Datalink (CPRD) death algorithm identifies a large number of deaths. CPRD provides a derived date of death (DoD). However, data on the algorithm performance are limited.

## OBJECTIVE

To evaluate a process for identifying and verifying cases of death and the DoD in the CPRD.

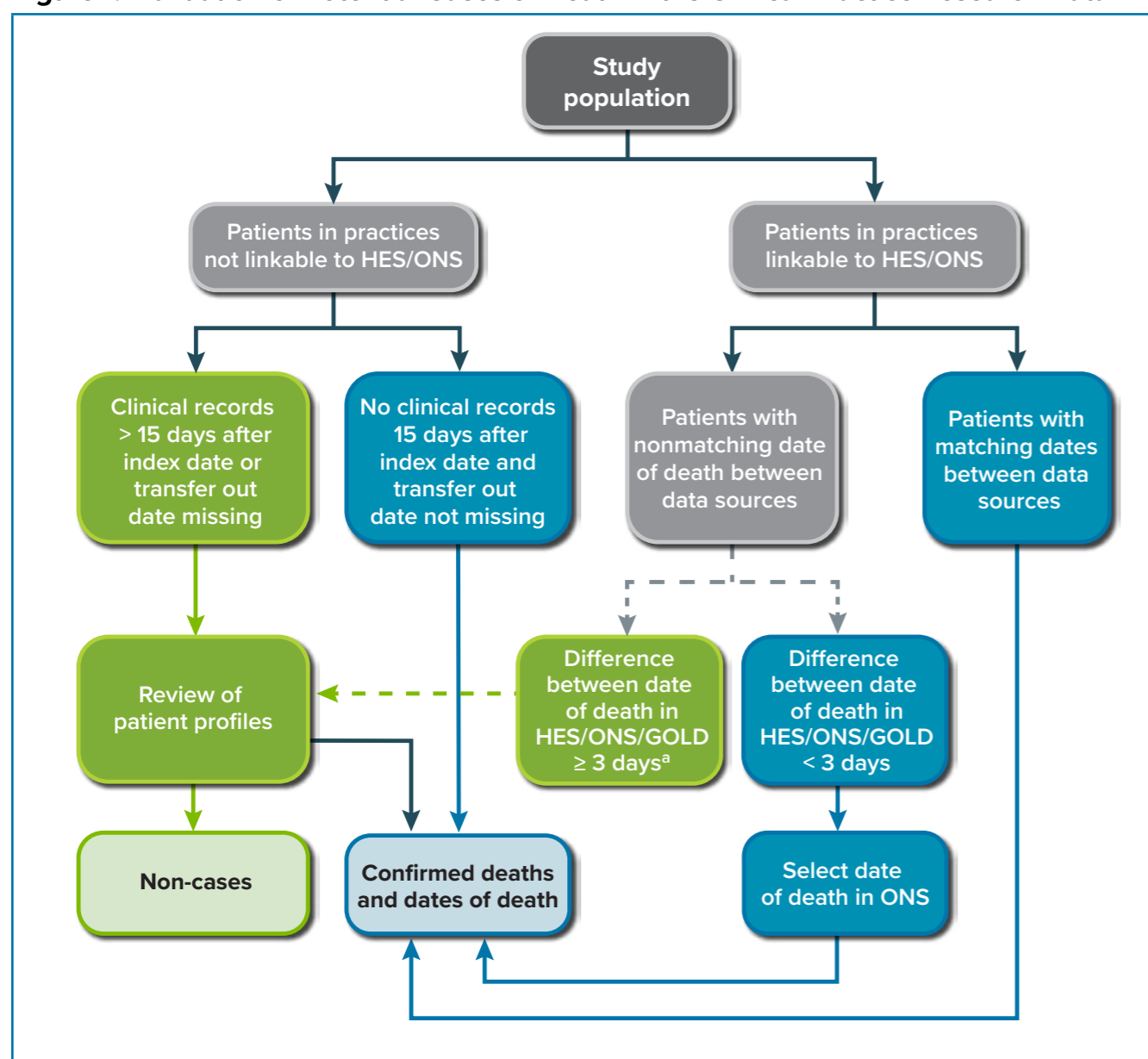
## METHODS

Deaths in a nested case-control study of all-cause mortality in a cohort of new users of selected chronic obstructive pulmonary disease (COPD) medications (September 2012–June 2016) were identified in the Hospital Episode Statistics (HES), the Office for National Statistics (ONS), and the CPRD General Practitioner Online Database (GOLD) through an electronic algorithm<sup>1</sup> and classified as confirmed (CONF) or potential (for clinical review) (Figure 1).

- In practices not linkable to HES/ONS (non-linkable practices [NLP]), potential deaths were those with recorded clinical information beyond 15 days after the DoD or with missing transfer-out date, and CONF deaths were all others.
- In practices linkable to HES/ONS (linkable practices [LP]), CONF deaths were those with matching DoD in ONS, HES, and CPRD GOLD and, if not matching, those with a DoD in ONS  $\leq 3$  days before or after the other sources' DoD. Potential deaths were those with nonmatching DoD between ONS, HES, and CPRD GOLD and for which the DoD in ONS was  $> 3$  days before or after the DoD in other sources, including patients with missing DoD in ONS or CPRD GOLD.

Two physicians blinded to the exposures of interest reviewed the patient profiles of potential deaths to adjudicate the death and DoD.

Figure 1. Validation of Potential Cases of Death in the Clinical Practice Research Datalink



## RESULTS

In CPRD GOLD, HES, and ONS, 3,822 deaths were identified in 39,788 users of selected COPD medications. Of these, 3,610 (94.5%) were CONF deaths through the electronic algorithm, and 212 (5.5%) were potential deaths (Table 1).

Table 1. Number of Deaths Identified, Confirmed, and Validated

	N	%
<b>Electronic algorithm</b>		
Deaths identified	3,822	100.0
Deaths confirmed	3,610	94.5
Potential deaths	212	5.5
<b>Patient profile review</b>		
Deaths reviewed	212	5.5
Deaths confirmed <sup>a</sup>	206-210	97.2-99.1
DoD confirmed <sup>a</sup>	191-195	91.4-93.3
DoD changed <sup>a</sup>	11-15	5.3-7.2
Deaths not confirmed <sup>a</sup>	< 5	–
<b>Total confirmed</b>	<b>3,819</b>	<b>99.9</b>

<sup>a</sup> Actual numbers are replaced by ranges or  $< 5$  to adhere to CPRD's small cell data protection policy.

- Patient profile review of potential deaths confirmed most cases ( $> 95\%$ ) (Table 2).
  - In NLP, the DoD changed for 13 cases (56.5%, 6 cases with an error in the year).
  - In LP, the DoD changed for  $< 5$  cases;  $< 5$  deaths with DoD missing in ONS were not confirmed.
  - Most of the adjudicated deaths in LP had the same DoD in ONS and HES but a later DoD in CPRD GOLD.
- Figure 2 shows the distribution of deaths in LP by the number of days of difference between DoD recorded in two data sources, and Table 3 shows the median number of days of difference between the DoD in two sources of data.

Table 2. Reasons for and Results of the Patient Profile Review of Potential Deaths

Reasons for Validation Through Patient Profile Review	Total in Each Category		Confirmed Death and Death Date		Confirmed Death and Changed DoD		Non-case	
	N	% <sup>a</sup>	N	% <sup>b</sup>	N	% <sup>b</sup>	N	% <sup>b</sup>
<b>Patients in practices not linkable to HES/ONS</b>								
Death identified in CPRD GOLD, with clinical codes beyond 15 days after DoD or transfer-out date <sup>c</sup> missing	23	10.8	10	43.5	13	56.5	0	0
<b>Patients in practices linkable to HES/ONS</b>								
Death identified in more than one data source with nonmatching DoD <sup>d</sup>	186-190	87.7-89.6	181-185	95.8-97.9	< 5	–	< 5	–
Different dates in CPRD GOLD, HES, and ONS <sup>d</sup>	161-165	85.2-87.3	156-160	96.3-98.8	< 5	–	0	0
DoD in ONS was missing <sup>d</sup>	6-10	3.2-5.3	< 5	–	0	0	< 5	–
DoD in CPRD GOLD was missing <sup>d</sup>	20	10.6	20	100.0	0	0	0	0
<b>Total<sup>d</sup></b>	<b>212</b>	<b>100.0</b>	<b>191-195</b>	<b>90.1-92.0</b>	<b>11-15</b>	<b>5.2-7.1</b>	<b>&lt; 5</b>	<b>–</b>

<sup>a</sup> Column percentage.

<sup>b</sup> Row percentage.

<sup>c</sup> Date of disenrollment from CPRD GOLD.

<sup>d</sup> Actual numbers are replaced by ranges or  $< 5$  to adhere to CPRD's small cell data protection policy.

Figure 2. Distribution of Deaths by Days Elapsed Between Recorded DoD in Different Data Sources in Linkable Practices

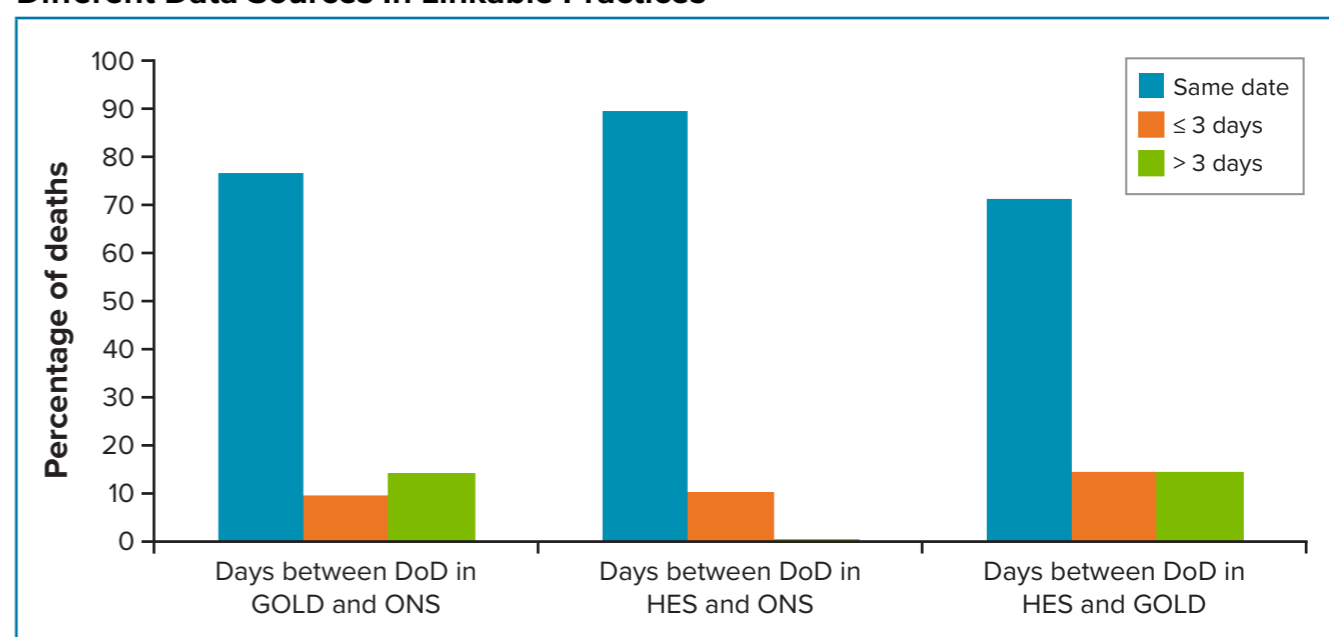


Table 3. Days of Difference Between DoDs Recorded in Different Data Sources in Linkable Practices

Difference Between Dates of Death in Data Sources	Median (Days)	Q1 (Days)	Q3 (Days)
CPRD GOLD and ONS	5	2	15
HES and ONS	1	1	1
HES and CPRD GOLD	3.5	1	14

Q1 = 25th percentile; Q3 = 75th percentile.

## CONCLUSIONS

- The electronic algorithm we used confirmed most deaths and DoD as derived by CPRD.
- Patient profile review confirmed most deaths identified as potential by the electronic algorithm.
- In LP, HES/ONS DoDs are usually correct, and most CPRD GOLD DoDs were recorded late. This is likely to occur also in NLP.
- We recommend:
  - In NLP, validation of death and DoD for those patients with clinical codes beyond 15 days after the DoD or with transfer-out date missing.
  - In LP, validation of cases with  $> 3$  days difference between the DoD in HES and ONS, irrespective of GOLD, or those for which the DoD is missing in ONS.

## ACKNOWLEDGEMENT

We thank Arlene Gallagher and Elizabeth Crellin (CPRD) for their support and insights.

## REFERENCES

- Health and Social Care Information Centre. A guide to linked mortality data from Hospital Episode Statistics and the Office for National Statistics. 2013. Available at: [http://content.digital.nhs.uk/media/1884/Doc-P---Payment-by-Results-datapdf/pdf/A\\_guide\\_to\\_the\\_linked\\_ONS-HES\\_mortality\\_dataV3.pdf](http://content.digital.nhs.uk/media/1884/Doc-P---Payment-by-Results-datapdf/pdf/A_guide_to_the_linked_ONS-HES_mortality_dataV3.pdf). Accessed 12 June 2017.

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