Reporting quality of randomized and non-randomized controlled trial abstracts from chicken research

Peerapol Sukon, Saijai Kongpechr, Sakolwan Bubpahou, Natchaya Boonpian, Natyaon Manasrisureeyun

In publication of a controlled trial article from health science research, the abstract is an important part that readers usually read first and then decide whether to read the whole article; therefore, information provided in the abstract should be adequate. The CONSORT (consolidated standards of reporting trials) for Abstracts checklist has been developed and used as a guideline for authors to prepare their manuscripts. This checklist has also been used as a tool to evaluate published abstracts. The objectives of this study were to evaluate reporting quality of randomized controlled trial (RCT) and non-RCT abstracts from chicken research and to determine factors associated with the reporting quality. We searched PubMed for RCT and non-RCT abstracts involving chicken research published between 2006 and 2015. The included abstracts were evaluated using the modified CONSORT for Abstracts checklist. The primary outcome was a mean overall quality score (OQS), which, for each abstract, was a sum of items reported in the modified CONSORT for Abstracts checklist. In addition, some pre-specified factors were evaluated for their association with the reporting quality using simple and multiple linear regression analyses. A total of 949 abstracts (n=262 for RCT and n=687 for non-RCT abstracts) were included and evaluated. Although OQS was significantly greater in RCT than in non-RCT abstracts (mean ± SD, 6.7 ± 0.9 vs 3.3 ± 1.1; *P*-value<0.001), both mean scores were still less than half of the full score of 15. Only 2 items—objective and conclusions—were adequately reported (>80%) in both types of the abstracts. Items concerning trial design, participants, interventions, randomization, and number randomized were adequately reported only in the RCT abstracts. In contrast, items concerning the study as randomized in the title, clearly defined primary outcome, blinding, numbers analyzed, estimated effect size and its precision for the primary outcome, trial registration, and funding were not reported or reported less than 5% in both RCT and non-RCT abstracts. In this study, 4 factors—year of publication, number of trials reported, number of experimental groups reported, and sample size reported—were associated with OQS. That is, abstracts with higher OQS were published more recently, reported a single trial rather than multiple trials, reported number of experimental groups rather than not reported, and reported sample size rather than not reported. These factors explained about 37.5% of the variance of OQS. In

conclusion, reporting quality of RCT and non-RCT abstracts from chicken research was suboptimal. Therefore, efforts especially the development of specific guidelines based on the CONSORT for Abstracts checklist should be made for reporting controlled trial abstracts from chicken research to improve the transparency, completeness, and sufficiently detailed of reporting.

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Abstract

In publication of a controlled trial article from health science research, the abstract is an important part that readers usually read first and then decide whether to read the whole article; therefore, information provided in the abstract should be adequate. The CONSORT (consolidated standards of reporting trials) for Abstracts checklist has been developed and used as a guideline for authors to prepare their manuscripts. This checklist has also been used as a tool to evaluate published abstracts. The objectives of this study were to evaluate reporting quality of randomized controlled trial (RCT) and non-RCT abstracts from chicken research and to determine factors associated with the reporting quality. We searched PubMed for RCT and non-RCT abstracts involving chicken research published between 2006 and 2015. The included abstracts were evaluated using the modified CONSORT for Abstracts checklist. The primary outcome was a mean overall quality score (OQS), which, for each abstract, was a sum of items reported in the modified CONSORT for Abstracts checklist. In addition, some pre-specified factors were evaluated for their association with the reporting quality using simple and multiple linear regression analyses. A total of 949 abstracts (n=262 for RCT and n=687 for non-RCT abstracts) were included and evaluated. Although OQS was significantly greater in RCT than in non-RCT abstracts (mean ± SD, 6.7 ± 0.9 vs 3.3 ± 1.1; *P*-value<0.001), both mean scores were still less than half of the full score of 15. Only 2 items—objective and conclusions—were adequately reported (>80%) in both types of the abstracts. Items concerning trial design, participants, interventions, randomization, and number randomized were adequately reported only in the RCT abstracts. In contrast, items concerning the study as randomized in the title, clearly defined primary outcome, blinding, numbers analyzed, estimated effect size and its precision for the primary outcome, trial registration, and funding were not reported or reported less than 5% in both RCT and non-RCT abstracts. In this study, 4 factors—year of publication, number of trials

reported, number of experimental groups reported, and sample size reported—were associated with OQS. That is, abstracts with higher OQS were published more recently, reported a single trial rather than multiple trials, reported number of experimental groups rather than not reported, and reported sample size rather than not reported. These factors explained about 37.5% of the variance of OQS. In conclusion, reporting quality of RCT and non-RCT abstracts from chicken research was suboptimal. Therefore, efforts especially the development of specific guidelines based on the CONSORT for Abstracts checklist should be made for reporting controlled trial abstracts from chicken research to improve the transparency, completeness, and sufficiently detailed of reporting.

Introduction

In health science research, randomized controlled trials (RCTs) are considered as a gold standard for evaluation of health benefits or harms of treatments or interventions because randomization can reduce bias in assigning subjects to treatments or vice versa. After RCTs have been conducted, they must be publicly reported for further use. Clear, transparent, and complete reporting of RCTs is necessary for readers to critically appraise. For this reason, CONSORT statement was first developed to improve RCT reporting in 1996 (Begg et al. 1996) and then updated in 2001 (Altman et al. 2001) and in 2010 (Moher et al. 2010). Recently, the CONSORT extension for reporting N-of-1 trials (CENT) 2015 statement was also developed (Vohra et al. 2015). Full reporting of an RCT contains many sections. One of the most important sections is an abstract because it is a summary of the whole RCT and the easiest section to access. Therefore, the abstract is read first by most readers. Unfortunately, in CONSORT statement, only one item is designed for reporting an abstract. To make the abstract having adequate information for readers, the CONSORT for Abstracts checklist was developed (Hopewell et al. 2008). This checklist serves authors to prepare the abstract of their manuscript and has been used as a gold

standard tool to evaluate reporting quality of an RCT abstract (Chhapola et al. 2016; Cui et al. 2014; Fleming et al. 2012; Ghimire et al. 2014; Guo & Iribarren 2014; Hua et al. 2015; Mbuagbaw et al. 2014). Findings from previous studies suggest that reporting quality of RCT abstracts from health research is suboptimal (Berwanger et al. 2009; Fleming et al. 2012; Ghimire et al. 2012; Guo & Iribarren 2014; Kiriakou et al. 2014; Seehra et al. 2013). Several factors such as abstract word limit, abstract format, publication year, impact factor of the journal may be associated with reporting quality of RCT abstracts (Ghimire et al. 2014; Guo & Iribarren 2014; Hua et al. 2015).

Unlike RCTs in human subjects, RCTs in livestock species are somewhat inherently different but they also need clear, transparent, and complete reporting. Therefore, a team led by O'Connor and Sargeant developed The REFLECT statement (O'Connor et al. 2010; Sargeant et al. 2010), the modified version of the CONSORT statement for reporting RCTs in livestock species. As a livestock species, chickens are a major protein source for human worldwide. Consumption of poultry meat throughout the world is estimated to be 13.8 kg per capita in 2015 and is expected to be 17.2 kg per capita in 2030 (FAO, http://www.fao.org/docrep/005/y4252e/y4252e05b.htm). To serve a massive need for consumers, most chickens sold in the market worldwide today are raised under mass production of poultry industry system. Research especially a controlled trial is needed to reduce the cost, to improve the production, and to solve health's problems in commercially raised chickens. Although a large number of controlled trials for livestock species have been published in each year and readers expect to read RCTs rather than non-RCTs, unfortunately, substantial proportions of non-RCTs have been reported in literature of livestock research (Sargeant et al. 2009; Snedeker et al. 2012).

On the top of our knowledge, reporting quality of controlled trials' abstracts in chicken research is lacking. The objectives of this study were to evaluate reporting quality of RCT and non-RCT

abstracts from chicken research by using the modified CONSORT for Abstracts checklist and to explore particular factors that may be associated with the reporting quality.

Methods

Literature search

We searched PubMed from 2006 to 2015 in July 2015 with the keywords “chicken” and “experiment”. The search detail was (("chickens"[MeSH Terms] OR "chickens"[All Fields] OR "chicken"[All Fields]) AND experiment [All Fields]) AND ("2006/01/01"[PDAT] : "2015/12/31"[PDAT]). The search was updated in October 2015 to get more recently added abstracts from the database.

Inclusion and exclusion criteria

In this study, we categorized the controlled trial abstracts into RCT and non-RCT abstracts based solely on information provided in the abstracts. The RCT and non-RCT abstracts were included if they involved (1) live chickens (either broiler or layer chickens) as experimental or observational units and (2) clearly defined a treatment or an intervention. We excluded abstracts that reported trials or experiments that involved chicken sperm, fertilized eggs, or chicken embryos. We also excluded abstracts that reported a single group experiment, an observation study, an in vitro study, a review, or an unrelated study to chicken species.

To ensure that a sample size of the selected abstracts is large enough for drawing a clear conclusion, we selected all abstracts that passed inclusion criteria in each year as a sample of our study, except for the year that a number of the abstracts exceeded 100. In this case, we randomly selected 100 abstracts by using computer-generated random sequence (https://www.random.org/).

Data extraction

We used the modified CONSORT for Abstracts checklist for data extraction (Table 1). The CONSORT for Abstracts checklist (Hopewell et al. 2008) is widely used as a tool to assess reporting quality for abstracts of randomized controlled trials in human (Chhapola et al. 2016; Cui et al. 2014; Fleming et al. 2012; Ghimire et al. 2014; Guo & Iribarren 2014; Hua et al. 2015; Mbuagbaw et al. 2014).This checklist consists of 17 items covering all important domains (title, trial design, methods, results, and conclusions) that are necessary for readers. Because some aspects of trials in chickens (as a livestock species) are inherently different from those of trials in human, we made a minor modification in the checklist to fit a context of chicken trials. Some information for this modification came from the REFLECT (reporting guidelines for randomized controlled trials in livestock and food safety) statement, the modified CONSORT statement for livestock species (O'Connor et al. 2010; Sargeant et al. 2010). Of the originally 17 items of the CONSORT for Abstracts checklist, 2 items (*authors* and *recruitment*) were excluded because the *authors* item is specific for conference abstracts and the *recruitment* item is not applicable to trials in chicken research. As a result, a table of checklist items with their original definitions and their modified definitions and a guideline for scoring was created (Table 1). For each item, we assigned score 0 if it was not reported or unclearly reported or score 1 if it was clearly reported. A minimum to maximum sum of scores is 0 to 15 for each included abstract.

In addition to data extraction for the modified CONSORT for Abstracts checklist, we extracted data for trial and abstract characteristics as follows: journal names, ISI impact factor (2014), year of publication, number of authors, continent location of the first author, word count of abstracts (excluding titles, author names and keywords), abstract format (structured vs unstructured), number of trials reported per abstract, number of experimental groups reported, and number of experimental chickens (If the abstract reported multiple trials, only the first trial of that abstract

was extracted for number of experimental groups and number of chickens). These characteristics were pre-specified factors and were used for simple and multiple linear regression analyses.

Pilot study

To validate data extraction method by using the modified CONSORT for Abstracts checklist in our study, we did a preliminary test for data extraction of this tool with 20 randomly selected abstracts by two of the authors (PS and SJ). To determine inter-rater reliability, we calculated kappa-statistic. Overall, kappa-statistic (95% confident interval) in scoring items was 0.81 (0.61 to 1.00), indicating that inter-rater agreement was good in this study (Landis & Koch 1977; Viera & Garrett 2005). We decided to extract all selected abstracts by two authors (PS and SJ). Disagreement was solved by consensus.

Outcomes measured and statistical analysis

The primary outcome was a mean overall reporting quality score (OQS). This score is a sum of items reported in the modified CONSORT for Abstracts checklist and ranges from 0 (minimum) to 15 (maximum). A score of 15 indicated a perfectly complete reporting of the abstract. The secondary outcome was the percentage or frequency of reporting for each item of the modified CONSORT for Abstracts checklist. In addition, odds ratio was calculated by comparing a rate of reporting for each item between the RCT and non-RCT abstracts.

We used SPSS version 17 for all statistical analyses. Descriptive statistics included frequencies, percentages, means, standard deviations, medians, and interquartile ranges. After checked with normal probability plots, OQS data were approximately normally distributed. We used two-independent sample t-test to compare OQS of the RCT vs non-RCT abstracts for each characteristic. We also used Chi-squared test for the odds ratio. To explore factors associated with OQS, we used simple and multiple linear regression analyses. These factors included: years of publication (continuous, 20006-2015), journal impact factors (<1, 1-2, or >2), regions of

publication (Asia, Europe, North American, or Others), number of authors (<4, 4-7, or >7), abstract format (structured or unstructured), trials reported (single or multiple), experimental groups reported (not reported, 2 groups, or >2 groups), and sample size reported (not reported, reported). A simple linear regression analysis was used to determine an association between OQS and each pre-specified factor described above. Only a significant factor (P<0.05) was further used for a multiple linear regression analysis. In this analysis, a final model was constructed by a backward elimination of non-significant factors. Multicollinearity of factors was determined by tolerance and variance inflation factor (VIF). Factors with a low tolerance (<0.1) or with a high VIF (>10) were excluded from the final model. All statistical tests were two tailed, and values of P <0.05 were considered significant.

Results

Literature search

The search initially identified 1896 abstracts. Of these, 838 abstracts were excluded with reasons (Fig. 1). The remaining 1058 abstracts were either RCT or non-RCT abstracts. These were further excluded to keep a maximum number of abstracts not exceed 100 for each publication year. Finally, a total of 949 abstracts were included for analysis. Of 949 abstracts, only 262 (27.6%) were RCT, but 687 (72.4%) were non-RCT abstracts. A proportion of the RCT abstracts slightly increased from 23.7% in 2006 to 34.1% in 2015 (Fig. 2).

Characteristics of included abstracts

Characteristics of the included abstracts are presented in Table 2. Poultry Science reported the majority of both RCT (42.3%) and non-RCT abstracts (42.5%). Most abstracts were unstructured (95% for RCT and 97.1% for non-RCT abstracts). The majority of the abstracts reported a single trial (86.5% for RCT and 66.6% for non-RCT abstracts). In addition, the majority of the abstracts

reported more than 2 experimental groups per trial (86.5% for RCT and 58.3% for non-RCT abstracts). More than half (54.0%) of the non-RCT abstracts did not reported a sample size.

Overall quality score (OQS)

Mean OQS (or mean number of items reported in abstracts) was 6.7 of 15 (SD, 0.9) for RCT abstracts and 3.3 of 15 (SD, 1.1) for non-RCT abstracts. Mean OQS for each characteristic and the mean difference between RCT and non-RCT abstracts are presented in Table 3. No abstract reported more than 9 items for RCT abstracts and more than 7 items for non-RCT abstracts (Fig. 3).

Item-specific reporting

Proportions of item-specific reporting for the RCT and non-RCT abstracts using the modified CONSORT for Abstracts checklist are shown with an associated odds ratio (Table 4).

Reporting of title and trial design

Both RCT and non-RCT abstracts did not report the title as "randomized". RCT abstracts reported trial design 96.9% compared with 3.1% for non-RCT abstracts.

Reporting of trial methods

RCT abstracts reported description of experimental chickens (participants) more often than non-RCT abstracts (89.2% vs 54.0%, respectively; $P<0.001$). The details of interventions were adequately reported in RCT abstracts (93.8%), compared with 74.2% in non-RCT abstracts. Both RCT and non-RCT abstracts adequately reported objectives of the studies (97.7% for RCT and 94.5% for non-RCT abstracts). Both RCT and non-RCT abstracts rarely reported the clearly defined primary outcome (3.8% for RCT and 4.9% for non-RCT abstracts). Randomization was completely reported in RCT abstracts (100%) but it was not reported in non-RCT abstracts.

Blinding (masking) was not reported in RCT abstracts and was reported only in one non-RCT abstract.

Reporting of trial results

Except for the *number randomized* item of RCT abstracts (80% reported), reporting all other items of trial results in both RCT and non-RCT abstracts was suboptimal. Especially, the *number analyzed* item was reported only in one RCT abstract and was not reported in non-RCT abstracts.

Reporting of conclusions, trial registration and funding

Conclusions were adequately reported in both RCT (90%) and non-RCT (82.7%) abstracts. However, no abstract reported trial registration and funding.

Factors associated with OQS

In a final model of multiple linear regression analysis, 4 factors—year of publication, number of trials reported, number of experimental groups reported, and sample size reported—were found to be associated with OQS (Table 5). That is, abstracts with higher OQS were published more recently, reported a single trial rather than multiple trials, reported number of experimental groups rather than not reported, and reported sample size rather than not reported. The R^2 for this model was 37.5%. In addition, mean OQS of both RCT and non-RCT abstracts was slightly improved over time (Fig. 4).

Discussion

In this study, we evaluated reporting quality of 949 controlled trial abstracts from chicken research published over the past 10 years (between 2006 and 2015) using the modified CONSORT for Abstracts checklist. Of 949 abstracts, the number of RCT abstracts (n=262) was substantially lower than that of non-RCT abstracts (n=687), although a proportion of RCT abstracts slightly increased in more recent years (Fig. 2). Our results indicated that overall

reporting quality was suboptimal for both RCT and non-RCT abstracts. As we used OQS to infer overall reporting quality of the abstracts (OQS of 15 indicated complete reporting), mean (SD) OQS was 6.7 (0.9) for RCT and 3.3 (1.1) for non RCT abstracts. Although mean OQS was significantly higher in RCT than in non-RCT abstracts, both means are less than half of the full score of 15. Interpretation of OQS should be done with caution. Low OQS did not mean low quality of conducting the trials. Because reporting quality and methodological quality of controlled trials are two different dimensions (for example, well-conducted trials may be reported poorly) (Huwiler-Müntener et al. 2002), this should be evaluated in different ways. Our findings were consistent with those of previous studies in other fields of health research that reporting quality of the abstracts was suboptimal (Berwanger et al. 2009; Chhapola et al. 2016; Ghimire et al. 2012; Guo & Iribarren 2014; Kiriakou et al. 2014; Seehra et al. 2013).

For item-specific reporting, our results indicated that reporting items in the modified CONSORT for Abstracts checklist varied highly from items to items. Approximately two-third of items was inadequately reported; indeed, several items (*title* indicating the study as randomized, *randomization*, *blinding*, *number randomized*, *number analyzed*, *trial registration*, and *funding*) were completely not reported in RCT or non RCT abstracts or both (Table 4). Our finding that both RCT and non RCT abstracts did not report title indicating the study as randomized was consistent with that of previous studies in livestock species (Sargeant et al. 2009; Snedeker et al. 2012). However, this was different from previous studies in human subjects that reporting title indicating the study as randomized was found more than half of the included abstracts (Ghimire et al. 2014; Mbuagbaw et al. 2014). These discrepancy results can be explained that after medical journals have been adopted the CONSORT statement as a guideline for manuscript preparation, reporting of title as randomized has improved over time (Ghimire et al. 2014; Mbuagbaw et al. 2014). Unlike medical journals, although the REFLECT statement was developed in 2010 to

improve reporting of RCT in livestock species, veterinary and animal science journals did not seriously implement this guideline. As a result, identifying RCT through database search may be more difficult for livestock species than for human. Like the title, trial registration and funding did not reported in RCT and non-RCT abstracts from chicken research. Trial registration is important to prevent un-publication of negative trials leading to publication bias (Dirnagl & Lauritzen 2010); therefore, leading medical journals require trial registration as a condition for acceptance of publication (De Angelis et al. 2004). However, on the top of our knowledge, a formal agency for registration of animal trials is not available but this issue is of concern especially for animal model of human disease (Perel et al. 2007). Reporting funding in the abstracts was not found in both RCT and non RCT abstracts. This finding may be due to journal house style because funding is usually reported in the "Acknowledgements" section. In previous studies, reporting of funding in abstracts of medical journals was varied from 0% (Cui et al. 2014) to 80% (Guo & Iribarren 2014) indicating journal house style; however, reporting this item was improved over time (Ghimire et al. 2014; Mbuagbaw et al. 2014).

In methodological domain, most items in this domain were better reported in RCT than in non-RCT abstracts from chicken research. Randomization, one of the most important items in this domain, is an experimental design tool used for reducing bias, and it is used for categorizing trials into RCTs and non-RCTs. Reporting quality of abstracts in medical literature is usually performed in RCTs only (Cui et al. 2014; Ghimire et al. 2012; Guo & Iribarren 2014; Hua et al. 2015; Kiriakou et al. 2014) because non-RCTs are not widely acceptable due to high risk of bias. However, in our study, we knew from the previous study in livestock species (Snedeker et al. 2012) that proportion of non-RCT abstracts outnumbered RCT counterparts; therefore, we decided to study both types of abstracts. Our result in chicken research literature confirmed a result of the previous study (Snedeker et al. 2012) that non-RCT abstracts were dominantly

published. For the *objective* item, our finding indicated that reporting this item was adequate for both RCT and non-RCT abstracts. This finding was consistent with that of previous studies in human trials (Fleming et al. 2012; Hua et al. 2015; Seehra et al. 2013). For the *outcome* item, reporting of clearly defined primary outcome was suboptimal for both RCT and non-RCT abstracts from chicken research. The included abstracts typically reported several outcomes but did not clearly specify the primary outcome. Blinding is also an experimental design tool for reducing bias; however, blinding was not reported in the RCT abstracts and was reported only 1/687 in the non-RCT abstracts indicating high risk of bias in the study's results of subjective outcomes. In medical journals, reporting of blinding in abstracts was also inadequate ranging from less than 10% (Cui et al. 2014; Guo & Iribarren 2014) to less than 40% (Ghimire et al. 2012), but it was improved over time (Hua et al. 2015; Mbuagbaw et al. 2014).

In result domain, *numbers analyzed* item was reported only 1/262 in the RCT abstracts and was not reported in the non-RCT abstracts. This finding was different from that in human studies, which had a rate of reporting for this item ranging from more than 10% (Guo & Iribarren 2014) to more than 50% (Ghimire et al. 2012; Ghimire et al. 2014). The discrepancy can be explained by difference in nature between animal and human trials. Reporting of number analyzed in human trials is crucial because participants may withdraw from trials at anytime resulting in a difference between number analyzed and number randomized. This situation is quite different from animal trials. Surprisingly, reporting outcome in the abstracts from chicken trials (for primary outcome, a result for each group and the estimated effect size and its precision) was inadequate (1.1% for RCT and 0.9% for non-RCT abstracts). This finding was also different from that in human trials (Ghimire et al. 2012; Mbuagbaw et al. 2014) because primary outcome was not clearly defined and precision of the estimated effect size was rarely reported in the abstracts from chicken research.

Many factors may be associated with overall reporting quality. In this study, we found 4 factors (year of publication, number of trials reported, number of experimental groups reported, and sample size reported) associated OQS. Although overall reporting quality of RCT and non-RCT abstracts from chicken research was suboptimal, our results indicated that the quality was slightly improved over time (Fig. 4). This finding is consistent with that of previous studies in medical journals (Ghimire et al. 2014; Mbuagbaw et al. 2014). In medical literature, it is clear that after medical journals adopted the CONSORT statement and the CONSORT for Abstracts checklist, overall reporting quality has been improved in both a full-text (Liu et al. 2015; Turner et al. 2012) and an abstract (Ghimire et al. 2014; Mbuagbaw et al. 2014). In an animal study, a concern of reporting quality has been raised for both laboratory animals and livestock species. Some useful guidelines (the ARRIVE guidelines for laboratory animals (Kilkenny et al. 2010) and the REFLECT statement for livestock species (Sargeant et al. 2010)) have been developed to help authors prepare their manuscripts of animal studies, but implementation is still not vigorous (Baker et al. 2014). Unlike in human trials that are commonly reported with one trial per an article, reporting multiple trials per article was found as high as 13.7% in RCT and 33% in non-RCT abstracts from chicken research (Table 2). As a space constraint in abstracts, the reporting quality was lower in multiple trials than in a single trial. The substantial number (24.6%) of the non-RCT abstracts did not report number of experimental groups resulting in low OQS. Two-parallel group design is commonly found in human trials, but majority of chicken trials is more than two groups (Table 2). Number of sample size (number of chickens, cages, pens, or other replicates) not reported in an abstract was substantial (12.8% for the RCT and 54.1% for the non-RCT abstracts) resulting in low OQS.

This study has several limitations. First, a comparison between the included abstracts and their corresponding full-text articles was beyond the scope of our study. With this in mind, reporting

316 quality of the abstracts may not be associated with or cannot infer to reporting quality of the full-
317 text articles. Second, RCT and non-RCT abstracts in this study were categorized based solely on
318 information in the abstracts. Interpretation about the abstract types should be done with caution
319 and should not be confused with a real design of the trials (RCTs and non-RCTs). That is, a real
320 study design of the particular non-RCT abstract may be either a randomized controlled trial or a
321 non-randomized controlled trial, depending on the detailed information provided in the method
322 section of a full-text article. Third, we used only PubMed database for this study; therefore, our
323 findings may not be a representative of all controlled trial abstracts from chicken research.
324 Inference of these findings to other databases should be carefully justified. Indeed, we did a
325 preliminary search with the same keywords in SCOPUS and ProQuest Agriculture Journals, and
326 we found that the number of initially identified abstracts in both databases were more than that in
327 PubMed. We expected that reporting quality of the abstracts in SCOPUS and ProQuest
328 Agriculture Journals was more heterogenous than that in PubMed because the former two
329 databases included more journals of chicken research than PubMed. Forth, we used the modified
330 CONSORT for Abstract checklist in which the original version was primarily assigned for use in
331 human trials. Even in human trials, criteria for scoring each item may be set or judged differently
332 depending on author perspectives. This may result in different reporting score from study to
333 study. In fact, different authors called "reporting quality score" differently, for example, overall
334 quality score (OQS) with full 18 point-scale (Ghimire et al. 2014), overall CONSORT score
335 (OCS) with full 16 point-scale (Hua et al. 2015). Lastly, multiple linear regression analysis
336 indicated significant association between some predictor factors (publication year, number of
337 trials reported, number of experimental groups reported, and sample size reported) and reporting
338 quality of the abstracts. Regarding the R^2 value, these 4 factors explained approximately 37.5% of
339 the variance of OQS in our final multiple regression model. Other potential factors beyond the
340 scope of our study might be associated with OQS. Despite several limitations, our study had a

large number of sample size of the included abstracts. In addition, on the top of our knowledge, this study would be the first study for evaluation of reporting quality of RCT and non-RCT abstracts from chicken research using the modified CONSORT for Abstracts checklist.

Conclusion

Although reporting quality was significantly better in RCT than in non-RCT abstracts from chicken research, reporting quality of both abstract types was suboptimal. The results of this study prompt the need of developing strategies to improve reporting quality in abstracts from chicken research. The development of specific guidelines based on the CONSORT for Abstracts checklist is one that should be made for reporting controlled trial abstracts from chicken research to improve the transparency, completeness, and sufficiently detailed of reporting.

Acknowledgements

We would like to thank Paphawi Theppharin, Panomyong Sittiwong, and Chitchanok Chitchuea for data verification.

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Figure 1(on next page)

Flow diagram of literature search and identification of controlled trial abstracts from chicken research.

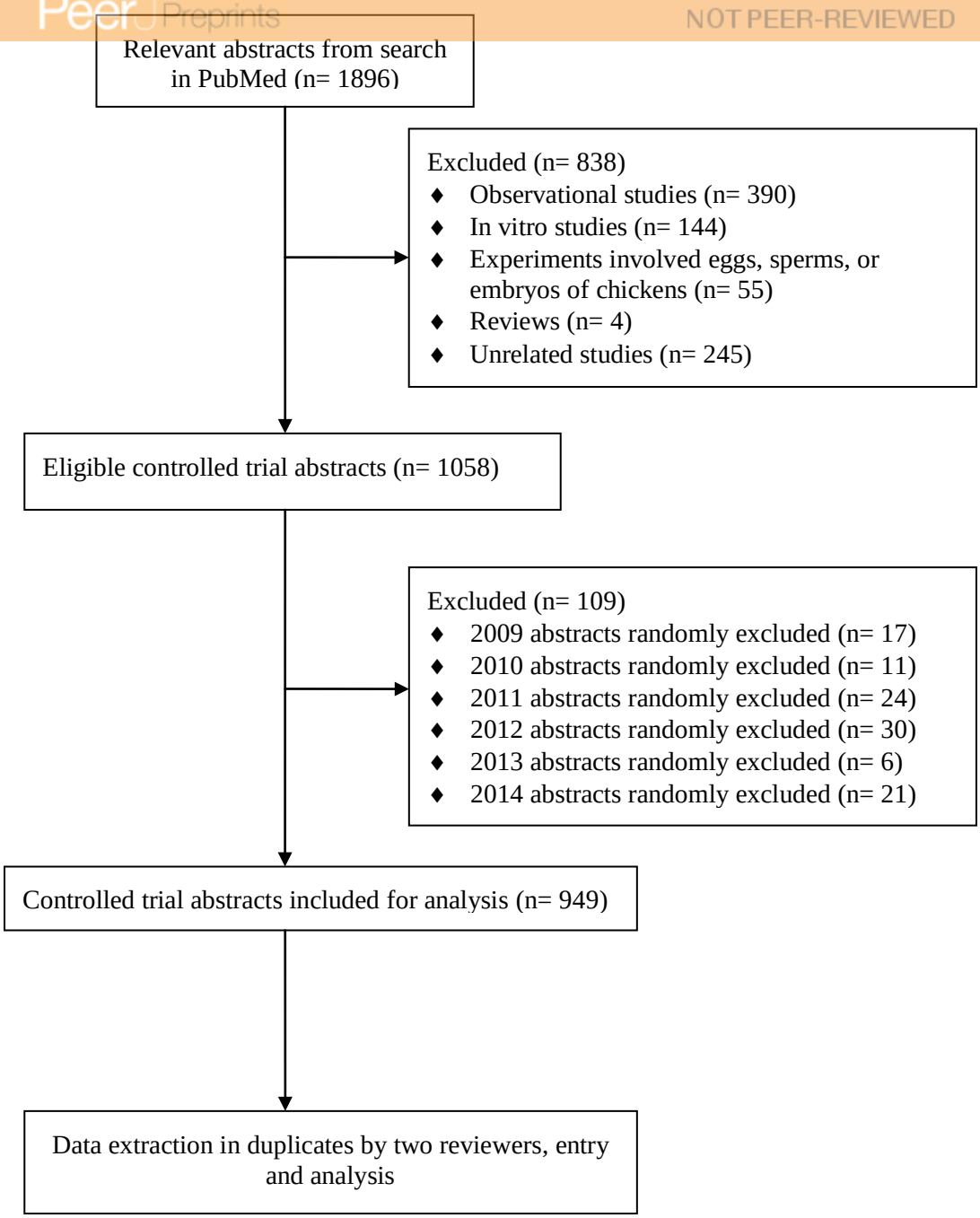

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Figure 2(on next page)

Number and percentage of the RCT and non-RCT abstracts in each year from 2006 to 2015.

Values within the bar are numbers of the RCT and non-RCT abstracts. Values above the bar are percentages of the RCT abstracts.

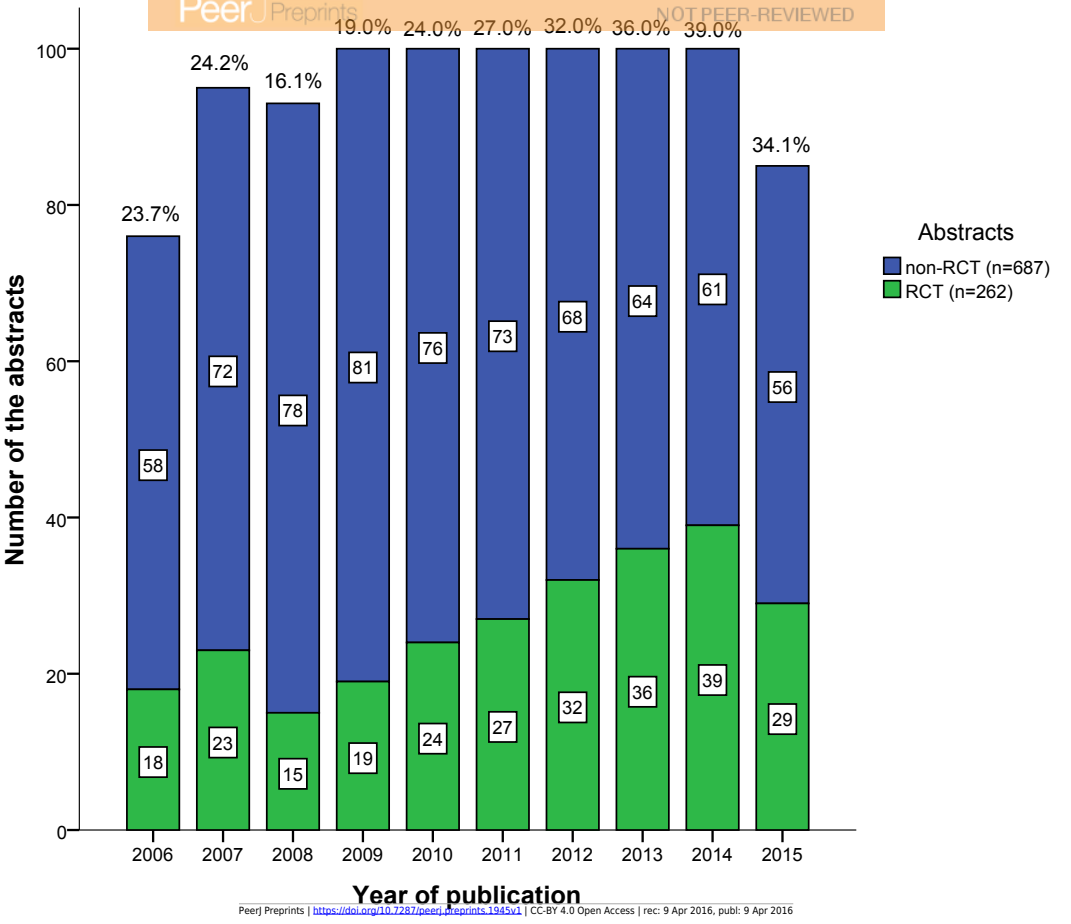

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Figure 3(on next page)

Percentages of the RCT and non-RCT abstracts reported the indicated number of items on the 15-item scale

Less than 15% of the RCT abstracts reported 8 items or more; in contrast, less than 15% of the non-RCT abstracts reported 5 items or more.

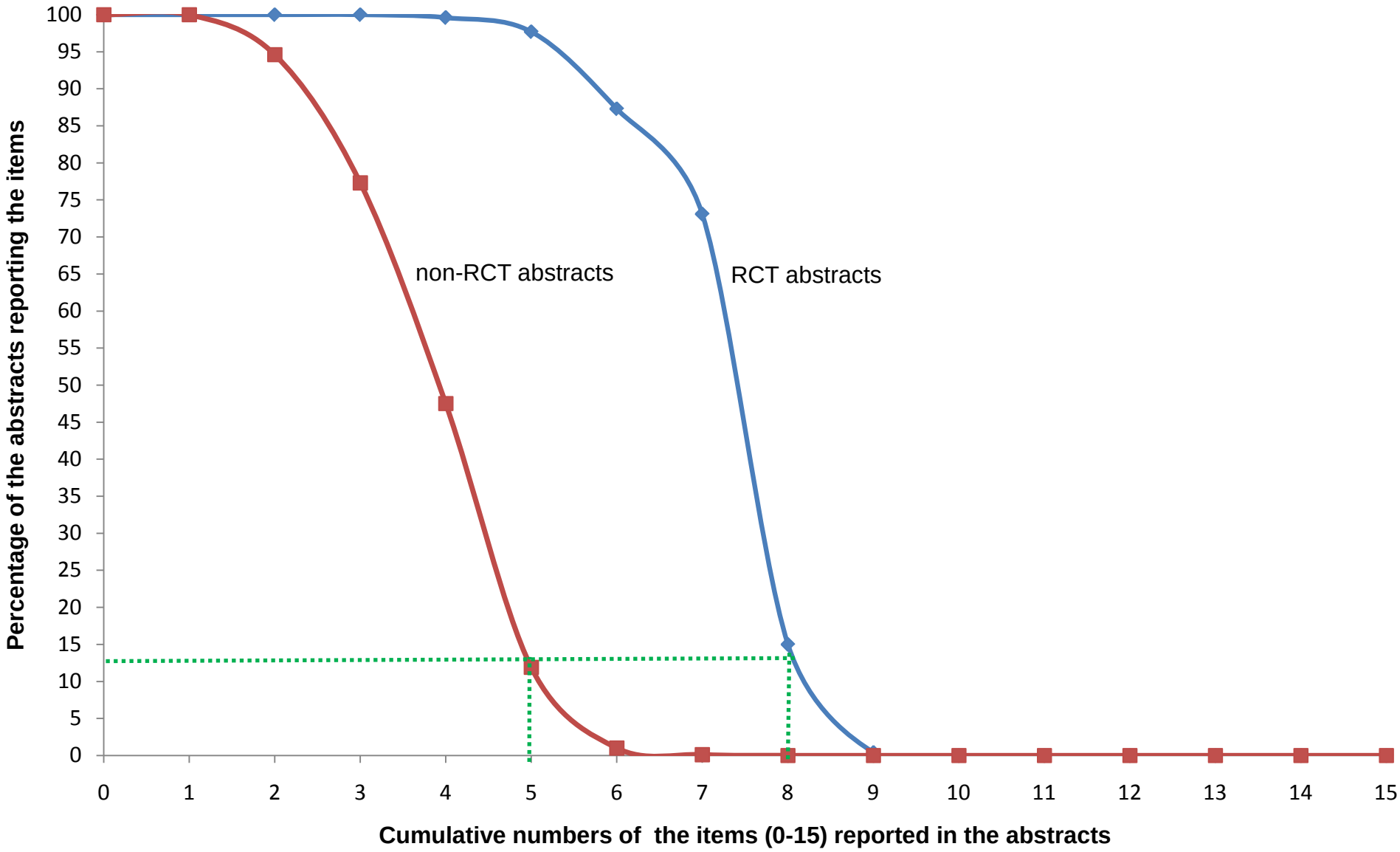

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Figure 4(on next page)

Mean OQS of the RCT and non-RCT abstracts from chicken research over the past 10 years. more.

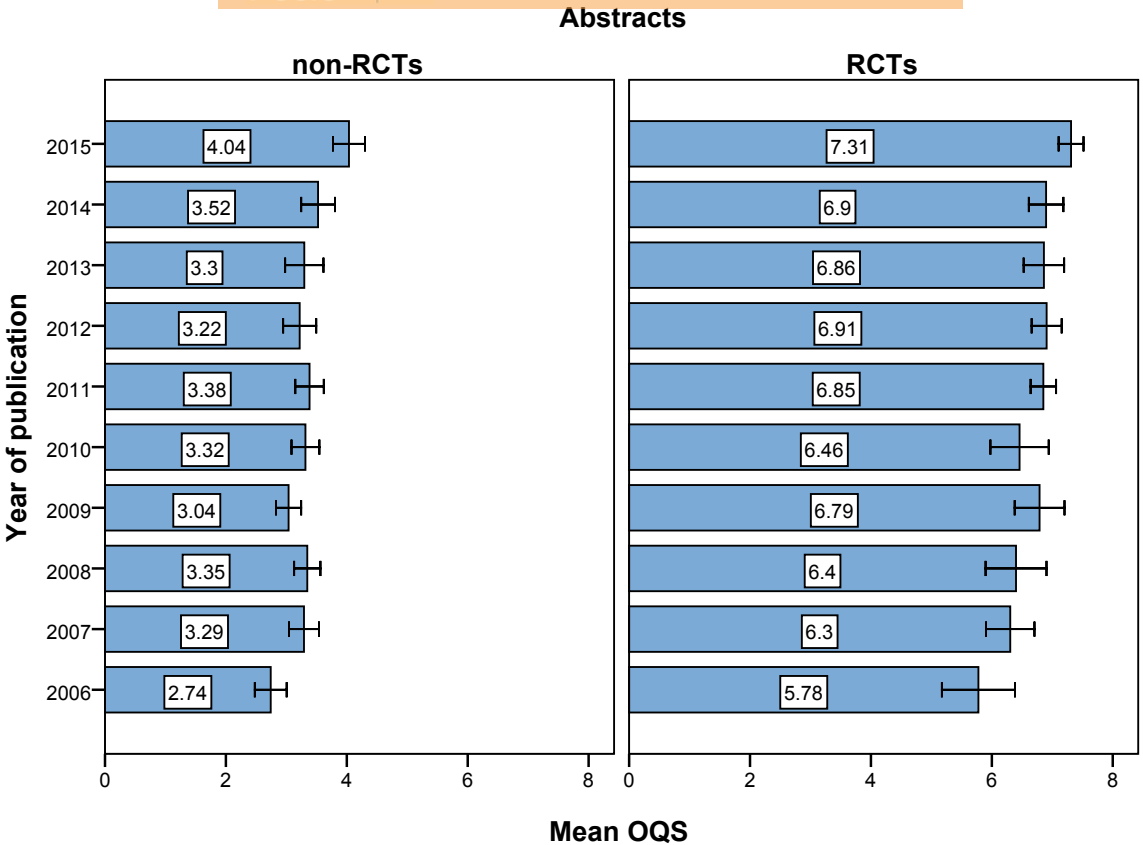

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Table 1(on next page)

The modified CONSORT for Abstracts checklist with guidance for scoring.

The CONSORT for Abstracts checklist (Hopewell et al. 2008) was modified to fit the context of controlled trials in chicken research.

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1

Item	Original Description	Specific Description for this study	Guidance for scoring
Title	Identification of the study as randomized	Same	1 point if "randomized" is reported in the title
Authors[a]	Contact details for the corresponding author	Same	This item is not included in this study.
Trial design	Description of the trial design (e.g. parallel, cluster, non-inferiority)	Same	1 point if trial design (e.g. parallel, completely randomized design, randomized complete block design, crossover design, Latin square design, and other key words that associated with specific trial design) is reported.
Methods			
Participants	Eligibility criteria for participants and the settings where the data were collected	Eligibility criteria for experimental chickens and the settings where the data were collected	1 point if description (e.g. breed, age, or sex) of the experimental chickens is reported.
Interventions	Interventions intended for each group	Same	1 point if the interventions intended for each group are reported.
Objective	Specific objective or hypothesis	Same	1 point if statement of objective, hypothesis or study aim is reported.
Outcome	Clearly defined primary outcome for this report	Same	1 point if clearly defined primary outcome or only one outcome is reported.
Randomization	How participants were allocated to interventions	How chickens or study units were allocated to interventions	1 point if chickens or study units were allocated to the treatments randomly (or vice versa) are reported.
Blinding (masking)	Whether or not participants, care givers, and those assessing the outcomes were blinded to group assignment	Whether or not care givers, and those assessing the outcomes were blinded to group assignment	1 point if blinding is reported.
Results			
Numbers randomized	Number of participants randomized to each group	Number of chickens or study units randomized to each group	1 point if number of chickens or study units randomized to each group are reported.
Recruitment[b]	Trial status	Not applicable	This item is not included in this study.
Numbers analyzed	Number of participants analyzed in each group	Number of chickens or study units analyzed in each group	1 point if number of chickens or study units analyzed in each group are

			reported.
Outcome	For the primary outcome, a result for each group and the estimated effect size and its precision	Same	1 point if a result of the primary outcome for each group and the estimated effect size and its precision are reported.
Harms	Important adverse events or side effects	Same	1 point if an important adverse event or a side effect is reported.
Conclusions	General interpretation of the results	Same	1 point if a conclusion is reported.
Trial registration	Registration number and name of trial register	Same	1 point if trial registration is reported.
Funding	Source of funding	Same	1 point if a source of funding is reported.

Notes

[a]This item is not included because it is specific to conference abstracts.

[b]This item is not included because it is not applicable to controlled trials in chicken research.

Table 2(on next page)

Characteristics of the included abstracts.

1

Characteristics	Abstracts, No. (%)	
	RCT (n=262)	Non-RCT (n= 687)
Journal		
Poult Sci	112 (42.7)	293 (42.6)
Br Poult Sci	33 (12.6)	102 (14.8)
J Anim Physiol Anim Nutr (Berl)	13 (5.0)	17 (2.5)
Biol Trace Elem Res	16 (6.1)	13 (1.9)
Avian Pathol	7 (2.7)	17 (2.5)
Other journals	81 (30.9)	245 (35.7)
Journal impact factor		
<1	65 (24.8)	158 (23.0)
1-2	169 (64.5)	416 (60.6)
>2	28 (10.7)	113 (16.4)
Region of publication		
Asia	131 (50.0)	202 (29.4)
Europe	47 (17.9)	235 (34.2)
North America	56 (21.4)	195 (28.4)
Others	28 (10.7)	55 (8.0)
Number of authors		
<4	71 (27.1)	214 (31.1)
4-7	159 (60.7)	397 (57.8)
>7	32 (12.2)	76 (11.1)
Abstract format		
Structured	13 (5.0)	20 (2.9)
Unstructured	249 (95.0)	667 (97.1)
Trials		
Single	226 (86.3)	458 (66.7)
Multiple	36 (13.7)	229 (33.3)
Experimental groups		
Not reported	9 (3.4)	169 (24.6)
2 groups	26 (10.0)	118 (17.2)
>2 groups	227 (86.6)	400 (58.2)
Sample size		
Not reported	33 (12.76)	372 (54.1)

Reported	229 (87.4)	315 (45.9)
Number of chickens/trial, median (IQR)[a]	256 (144 to 510)	200 (72 to 426)
Word count, median (IQR)	281 (236 to 319)	277 (229 to 321)

Notes

Abbreviations: IQR, interquartile range; RCT, randomized controlled trial.

[a]If an abstract reported more than one trial, number chickens were determined from the first trial only.

Table 3(on next page)

Mean OQS for characteristics and the mean difference between the RCT and non-RCT abstracts.

1

Characteristics	OQS, Mean ± SD		Mean difference (95% CI)	*P*-value
	RCT abstracts	Non-RCT abstracts		
Journal				
Poult Sci	6.7 ± 0.9	3.4 ± 1.1	3.3 (3.1 to 3.6)	<0.001
Br Poult Sci	6.5 ± 0.9	3.3 ± 1.0	3.2 (2.8 to 3.6)	<0.001
J Anim Physiol Anim Nutr (Berl)	6.9 ± 0.5	3.6 ± 1.1	3.3 (2.7 to 4.0)	<0.001
Biol Trace Elem Res	7.3 ± 0.6	3.9 ± 1.1	3.4 (2.8 to 4.0)	<0.001
Avian Pathol	6.6 ± 1.3	3.4 ± 1.2	3.2 (2.1 to 4.3)	<0.001
Other journals	6.8 ± 1.0	3.2 ± 1.1	3.6 (3.3 to 3.8)	<0.001
Journal impact factor				
<1	6.5 ± 0.9	3.3 ± 1.0	3.2 (2.9 to 3.5)	<0.001
1-2	6.8 ± 0.9	3.4 ± 1.1	3.4 (3.2 to 3.6)	<0.001
>2	6.9 ± 1.1	3.2 ± 1.2	3.7 (3.2 to 4.2)	<0.001
Region of publication				
Asia	6.8 ± 0.9	3.5 ± 1.1	3.3 (3.1 to 3.6)	<0.001
Europe	6.7 ± 0.9	3.3 ± 1.1	3.4 (3.1 to 3.8)	<0.001
North America	6.5 ± 0.9	3.2 ± 1.0	3.3 (3.0 to 3.6)	<0.001
Others	6.7 ± 1.1	3.4 ± 1.3	3.3 (2.7 to 3.9)	<0.001
Number of authors				
<4	6.6 ± 1.1	3.3 ± 1.1	3.3 (3.0 to 3.6)	<0.001
4-7	6.8 ± 0.9	3.3 ± 1.1	3.5 (3.3 to 3.6)	<0.001
>7	7.0 ± 0.8	3.4 ± 1.2	3.6 (3.1 to 4.0)	<0.001
Abstract format				
Structured	6.7 ± 1.4	3.4 ± 1.0	3.3 (2.4 to 4.2)	<0.001
Unstructured	6.7 ± 0.9	3.3 ± 1.1	3.4 (3.3 to 3.6)	<0.001
Trials				
Single	6.8 ± 0.9	3.5 ± 1.1	3.3 (3.1 to 3.4)	<0.001
Multiple	6.6 ± 0.9	3.0 ± 1.1	3.6 (3.2 to 3.9)	<0.001
Experimental groups				

Not reported	5.0 ± 1.7	2.4 ± 1.0	2.6 (1.9 to 3.3)	<0.001
2 groups	6.8 ± 0.7	3.4 ± 1.0	3.4 (3.0 to 3.8)	<0.001
>2 groups	6.8 ± 0.9	3.7 ± 0.9	3.1 (3.0 to 3.3)	<0.001
Sample size				
Not reported	5.6 ± 1.0	2.9 ± 1.1	2.7 (2.4 to 3.1)	<0.001
Reported	6.9 ± 0.8	3.8 ± 0.9	3.1 (2.9 to 3.2)	<0.001
Overall	6.7 ± 0.9	3.3 ± 1.1	3.4 (3.3 to 3.7)	<0.001

Notes

Abbreviations: CI, confident interval; OQS, overall quality score; RCT, randomized controlled trial; SD, standard deviation.

Table 4(on next page)

Item-specific reporting of the RCT and non-RCT abstracts.

1

Items	Abstracts, No. (%)		Odds ratio (95% CI)	*P*-value
	RCT (n=262)	Non-RCT (n=687)		
Title	0	0	Not estimable	
Trial design	254 (96.9)	21 (3.1)	1006.9 (440.4 to 2302.4.3)	<0.001
Methods				
Participants	233 (88.9)	371 (54.0)	6.8 (4.5 to 10.4)	<0.001
Interventions	246 (93.9)	509 (74.1)	5.4 (3.2 to 9.2)	<0.001
Objective	256 (97.7)	649 (94.5)	2.5 (1.0 to 6.0)	0.036
Outcome	10 (3.8)	34 (4.9)	0.8 (0.4 to 1.6)	0.477
Randomization	262 (100)	0	Not estimable	
Blinding (masking)	0	1 (0.1)	Not estimable	
Results				
Numbers randomized	210 (80.2)	0	Not estimable	
Numbers analyzed	1 (0.4)	0	Not estimable	
Outcome	3 (1.1)	6 (0.9)	1.3 (0.3 to 5.3)	0.688
Harms	52 (19.8)	114 (16.6)	1.3 (0.9 to 1.8)	0.212
Conclusions	236 (90.1)	568 (82.7)	1.9 (1.2 to 3.0)	0.005
Trial registration	0	0	Not estimable	
Funding	0	0	Not estimable	

2 **Notes**

3 Abbreviations: CI, confident interval; RCT, randomized controlled trial.

Table 5(on next page)

Linear regression analyses for exploring factors associated with the OQS.

1

Characteristics	Univariate analysis, estimate (95% CI)	*P*-value	Multivariate analysis[a], estimate (95% CI)	*P*-value	Tolerance	VIF
Year of publication	0.16 (0.12 to 0.20)	<0.001	0.09 (0.06 to 0.13)	<0.001	0.95	1.05
Journal impact factor						
<1	Reference					
1-2	0.08 (-0.21 to 0.37)	0.585				
>2	-0.35 (-0.74 to 0.04)	0.080				
Region of publication						
Asia	Reference					
Europe	-0.97 (-1.26 to -0.69)	<0.001				
North America	-0.87 (-1.16 to -0.57)	<0.001				
Others	-0.28 (-0.71 to 0.16)	0.209				
Number of authors						
<4	Reference					
4-7	0.19 (-0.08 to 0.45)	0.168				
>7	0.34 (-0.07 to 0.75)	0.105				
Abstract format						
Structured	Reference					
Unstructured	-0.46 (-1.1 to 0.18)	0.161				
Trials						
Single	Reference					
Multiple	-1.1 (-1.35 to -0.84)	<0.001	-0.28 (-0.50 to -0.06)	0.014	0.89	1.13
Experimental groups						
Not reported	Reference					
2 groups	1.51 (1.15 to 1.87)	<0.001	0.92 (0.58 to 1.25)	<0.001	0.61	1.65
>2 groups	2.26 (1.99 to 2.54)	<0.001	1.35 (1.07 to 1.63)	<0.001	0.51	1.95
Sample size						
Not reported	Reference					
Reported	1.99 (1.79 to 2.19)	<0.001	1.36 (1.14 to 1.57)	<0.001	0.76	1.32
Word count						
< median (279)	Reference					
≥ median (279)	0.09 (-0.15 to 0.32)	0.464				

2 **Notes**

3 Abbreviation: CI, confident interval; VIF, variance inflation factor.

[a]For multivariate analysis, constant = -179.96, R^2 = 0.375, adjusted R^2 = 0.372, and P <0.001.