Review of "Real-World Personal Conversations Using a Hands-Free Embedded Wireless Device While Driving: Effect On Airbag Deployment Crash Rates" by Richard A. Young and Christopher Schreiner

Elisa R. Braver
Adrian K. Lund
Anne T. McCartt

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INSURANCE INSTITUTE
FOR HIGHWAY SAFETY
1005 NORTH GLEBE ROAD ARLINGTON, VA 22201
PHONE 703/247-1500 FAX 703/247-1678
www.iihs.org

SUMMARY

A large body of research has addressed the risk of talking on a cellphone while driving (McCartt et al., 2006). Experimental studies find impairment in simulated or test-track driving performance among users of hand-held and hands-free phones. Epidemiologic studies have observed increased crash risk among drivers talking on both kinds of phones (McEvoy, Stevenson, McCartt et al., 2005; Redelmeier and Tibshirani, 1997).

Results of a new study by Young and Schreiner (2009) appear to contradict these findings, but methodological issues limit the conclusions that can be drawn. The authors aimed to study the crash risk associated with talking on a particular hands-free in-vehicle mobile phone system: General Motors' OnStar, which automatically provides notification of an airbag deployment and records the deployment time. OnStar also records times of OnStar conversations. Examining the occurrence of crashes resulting in an airbag deployment among OnStar subscribers who made at least one OnStar hands-free call per month, Young and Schreiner reported a nonsignificant 38 percent decrease in risk during OnStar calls compared with periods during which OnStar calls were not in progress. The authors concluded "that for personal conversations using a hands-free embedded device the risk of an airbag crash is somewhere in a range from a moderately lower risk to a risk near that of driving without a recent personal conversation. These results are not consistent with the large increase in crash risk reported in epidemiological studies using the case-crossover method" (p. 187).

One major limitation of the study is that it did not control for factors that could confound the relationship between OnStar calling and involvement in airbag deployment crashes. OnStar calls may be made during very different traffic conditions, including those involving lower crash risk, compared with periods without OnStar calls. This problem is exacerbated by the inclusion of data for drivers who used OnStar calling as little as once a month; clearly, OnStar calling was atypical behavior for them. No distinction was made between occasional OnStar users versus heavy users. A complication is that people were talking on other types of cellphones during an unknown portion of the periods in which they were not using OnStar, but the airbag deployment numbers and driving minutes during these other types of cellphone conversations are unknown. Thus, we do not know how the risk of OnStar calls compared with the risk of other hands-free systems, hand-held phones, or periods of no phone use.

Another limitation is that driving time during the comparison period when OnStar calls were not being made was unknown and had to be estimated using data from other fleets whose comparability to the fleet of drivers in this study is unknown. Due to the uncertainty of the estimates of comparison driving time, the true relative risk associated with OnStar use could have been higher or lower than the authors estimated.

This study does not negate extensive scientific findings indicating that driver cellphone use impairs driving performance and increases crash risk. There is no plausible explanation for why making

hands-free calls would be protective against crashes, which is what is suggested by Young and Schreiner's estimated risk ratio. Compensatory behavior is unlikely to reduce crash risk below that of the comparison period. Because potential confounding factors were not addressed, the study cannot provide a definitive answer as to whether placing OnStar calls posed an increased risk to OnStar users. Nor do we know whether OnStar risk is the same as risk associated with other cellphone systems. In the end, the only conclusion that can be drawn from this study is that airbag deployment crashes occurred at a rate of 5.08 per 100 million driver minutes of OnStar hands-free calling. Whether this rate is high or low cannot be determined from this study because there is uncertain information about the number of comparable minutes driven without OnStar calling and the distribution of driving conditions for OnStar and noncalling minutes is unknown.

DESCRIPTION OF STUDY

Young and Schreiner (2009) estimated the risk of involvement in a crash resulting in an airbag deployment while making an OnStar hands-free call versus driving while not making such a call. The study period was June 2001 through November 2003, and the study population consisted of OnStar subscribers operating General Motors passenger vehicles.

The measure of association was an incidence rate ratio, which is similar to a relative risk and incorporates person-time in the denominators. The at-risk period was defined as any driver-minute during which an OnStar call was made, and the comparison period was defined as any driver-minute in which such a call was not recorded (OnStar calls excluded those to OnStar advisors). Thus, every eligible driver who used OnStar at least once during a study month was included in both the at-risk and comparison periods. The average number of subscribers making at least one OnStar call per month was 323,994 each month during the study period, with the numbers ranging from 37,213 when the study began in June 2001 to 596,203 during November 2003. Data were not analyzed by frequency of cellphone use.

A crash was defined as occurring during an OnStar call if an airbag deployed during such a call or if a call had ended 1 minute before the airbag notification time. This allowed some margin of error in the event that recorded times were off by 59 seconds. Calls initiated after an airbag deployment were excluded. The authors estimated an airbag deployment crash incidence rate ratio of 0.62 using the following numbers of airbag deployments, driver-minutes on OnStar, and estimated driver-minutes when not talking on OnStar.

At-risk period: 14 deployments per 276 million driver-minutes of OnStar calls
= 5.08 airbag crashes per 100 million driver-minutes
Comparison period: 2,023 deployments per 24.7 billion driver-minutes of no OnStar calls
= 8.18 airbag crashes per 100 million driver-minutes
Incidence rate ratio: = 5.08/8.18 = 0.62 (95 percent confidence interval: 0.37-1.05)

The incidence rate ratio increased slightly from 0.62, but did not reach 1.0, when the time window prior to airbag notification was increased to 2-3 minutes. The incidence rate ratio decreased markedly from 0.62 to 0.36 when the authors extended the window of risk to include up to 20 minutes after the end of a call.

The exact duration of OnStar calls was known, which enabled computation of deployments per 100 million driver-minutes of OnStar calling. However, driving time during periods without OnStar calls had to be estimated based on assumptions about average daily distance driven and average speed. The average speed (31.3 mph) was derived from a sample of 171 instrumented General Motors vehicles. Average daily distance was derived from a sample of 585,719 OnStar vehicles with odometers that reported the miles driven per day electronically to OnStar over a 12-month period during 2005-06.

CRITIQUE OF STUDY

Interpretation of the scientific literature is incorrect

Young and Schreiner (2009) reviewed previous research on cellphone use. They criticized case-crossover studies, a technique used by the two studies that had the most rigorous methods, including use of cellphone billing records and detailed interviews (McEvoy et al., 2005; Redelmeier and Tibshirani, 1997). The main criticism was that cases (drivers involved in crashes) may differ from those not involved in crashes, yet drivers who are at risk of getting into crashes are exactly the population that is of interest. The case-crossover design, in which individual drivers involved in crashes are compared with themselves with respect to phone use during periods when they were not involved in a crash, is an excellent method for studying transient risk factors such as cellphone use (Rothman and Greenland, 1998). Moreover, case-crossover studies are better able to control for extraneous factors that influence both crash risk and cellphone use than traditional cohort or case-control studies because they control for variables such as travel patterns, propensity to take risks, driving routes, and other variables that are hard to measure. Time of day and measurable driver characteristics, such as age and gender, also are controlled in case-crossover designs.

Another of Young and Schreiner's criticisms was that Redelmeier and Tibshirani (1997) did not know whether drivers involved in crashes had been operating vehicles during comparison periods. Young and Schreiner acknowledged that McEvoy et al. (2005) had attempted to ensure that comparison periods occurred while the drivers were operating vehicles but dismissed this measure as subject to recall bias, which refers to the potential for cases having a better memory of their past exposures than controls (Rothman and Greenland, 1998). This bias was not likely to be present in the study by McEvoy et al. for two reasons: cellphone billing records were obtained so their cellphone use data were objective. Subjects were interviewed by McEvoy et al. soon after their crashes, so they would have known the times they had

been on the road during their comparison periods (24 hours, 72 hours, and 7 days prior to the crash). There is no plausible reason to suspect that subjects would systematically misremember times they were driving rather than making random errors in memory.

Driving time during the comparison period is uncertain

Young and Schreiner estimated that the average driving time per day was 84.5 minutes during periods in which OnStar calls were not recorded. This estimate was partly based on a small number (N=171) of instrumented vehicles whose average daily speeds (31.3 mph) were recorded. The speed data could not account for regional variation; also, average driving speeds among people who talk on cellphones while driving may differ from the drivers in the instrumented vehicles. For example, average daily driving time was 106 minutes among 1,006 cellphone users surveyed in North Carolina (Stutts et al., 2003), which is greater than Young and Schreiner's estimate. Underestimation of driving time without OnStar calls would result in an underestimation of the true risk associated with using OnStar while driving because the comparison period rate consisted of airbag deployments divided by driver-minutes. The estimate of 8.18 airbag crashes per 100 million driver-minutes without OnStar calling would be too high if the driving time were understated. Overestimation of driving time also is possible because the driving time is unknown.

Young and Schreiner were unable to control for potential confounding factors associated with making OnStar calls and crash involvement

There could have been important differences between the study and comparison conditions. The authors provided no evidence that driving conditions during periods of OnStar calls were similar to driving conditions when OnStar was not being used. For example, if people were more likely to make OnStar calls during periods when traffic was congested or on limited-access highways than during travel conditions of higher risk, the likelihood of involvement in a crash serious enough to trigger an airbag deployment would be lower than periods without OnStar calls. Thus, the failure to detect an increased risk during OnStar calls versus comparison periods could be due to conditions associated with OnStar use.

It is unclear whether the population of drivers making OnStar calls resembled the drivers who were not making OnStar calls. The eligibility criterion (making at least one OnStar call each month) did not distinguish between occasional OnStar callers and heavy users of the system. No risk estimates were provided for different categories of cellphone use.

Because potential confounding factors were not addressed, the study should be considered exploratory and unable to provide a definitive answer as to whether placing OnStar calls posed an increased risk to OnStar users. In contrast, the case-crossover studies criticized by Young and Schreiner did control for potential confounding factors such as driver characteristics and time of day.

Interpretation of findings is hampered by use of other cellphone systems during comparison periods

OnStar charges per minute are more expensive than charges for regular mobile phones, so a considerable portion of the OnStar user population combines OnStar minutes with minutes from other cellphones when driving (Shea, 2003). Separate phone numbers are assigned to OnStar, and some people attempting to reach an OnStar subscriber would be less likely to call the OnStar number than the regular cellphone number. This increases the likelihood that a driver with OnStar would be talking on another phone. No inferences can be drawn about the relative risk of OnStar use compared with use of other hands-free cellphone systems or use of hand-held cellphones because we do not know either minutes of exposure to other cellphones or which airbag deployments occurred during use of those other phones.

Even if the findings were shown to be accurate, they would not apply to hands-free phones other than OnStar

The conclusions that can be drawn from Young and Schreiner are limited and cannot be extrapolated to other types of hands-free cellphones. OnStar calls also may differ in duration from calls on other cellphones. Young and Schreiner indicated that the average billed call duration was 2.02 minutes. A different study reported that the average length of cellphone calls made while driving was 3.93-4.18 minutes during 2001-03 (Bridge Ratings, 2007).

Previous scientific evidence suggests that drivers would be distracted by hands-free OnStar conversations

Laboratory and test-track studies have reported impaired driving performance when subjects were talking on hands-free mobile phones (McCartt et al., 2006). McEvoy et al. (2005) observed an increased risk of involvement in crashes resulting in hospitalization among drivers using cellphones, the majority of whom had hands-free phones in their vehicles. The acts of speaking and, perhaps, voice-dialing, can be distracting. Like other hands-free calls, OnStar calls keep drivers from focusing full attention on the road. When discussing their findings, the authors speculated that drivers making OnStar calls are aware of the risk and may take compensatory measures to reduce it. However, compensatory behavior rarely eliminates real risk. People using other types of cellphone systems, whether hand-held or hands-free, also may attempt to compensate for the distraction. Research indicates that talking on a cellphone while driving increases the chances of crashing.

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