Supplementary Materials

Abuse deterrent opioids: a survey of physician beliefs, behaviors, and psychology

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Figure 3b: Reasons for NOT prescribing ADFs

| Reason                      | Freq. | Percent | Cum.   |
|-----------------------------|-------|---------|--------|
| Disagree                    | 78    | 20.86   | 29.41  |
| Not effective at all        | 57    | 15.49   | 15.49  |
| Smoking                     | 39    | 11.47   | 90.59  |
| Very effective              | 31    | 8.45    | 67.03  |
| Somewhat effective          | 29    | 7.88    | 61.14  |
| Effective                   | 66    | 17.98   | 59.13  |
| Total                       | 368   | 100.00  |        |

Figure 2b: Impression of ADF need and effectiveness by route of administration

| Route                | Freq. | Percent | Cum.   |
|----------------------|-------|---------|--------|
| Subcutaneous         | 11    | 3.05    | 13.07  |
| Oral                 | 88    | 23.91   | 37.77  |
| Snorting             | 39    | 11.47   | 90.59  |
| Total                | 148   | 40.68   |        |

Appendix

Questions For Observations (8 observations deleted)

Exclude no response to 6th/7th question incorporating skip logic (if ADF considered, which pt factors influence): 20.86

Exclude if no response to 2nd question (ADF familiarity): 23.91

Exclude non-controlled substance prescribers: 21.65

Total responses: 725 Martin Luther King Jr. Blvd., UNC CB 7505, Chapel Hill, NC 27599 USA
Practice setting and likelihood to support ADF labeling

| Route of Prescribe | Risk of Abuse |
|-------------------|--------------|
| | |

| Primary Route of Abuse | Opioid Problem |
|------------------------|----------------|
| | |

| Community Setting | Strongly Agree | Strongly Disagree |
|-------------------|----------------|------------------|
| | |

| Specialty | Freq. | Percent |
|-----------|-------|---------|
| Psychiatry | 4 | 1.07 |
| Cardiovascular Disease | 4 | 1.07 |
| Urology | 5 | 1.34 |
| Hematology & Oncology | 9 | 2.41 |
| Pediatrics or Neonatal-Perinatal Medicine | 10 | 2.67 |

| Formulation | Freq. | Percent |
|-------------|-------|---------|
| MorphaBond® extended-release | 14 | 28.57 |

| Influence | Freq. | Percent |
|-----------|-------|---------|
| Great | 31 | 10.00 |
| Some to Great | 51 | 16.45 |
| Little to No | 91 | 29.07 |

| Abuse Deterrent | Freq. | Percent |
|-----------------|-------|---------|
| Little to No Influence | 55 | 84.35 |
| Some to Great Influence | 16 | 15.65 |

| Record ID | Freq. | Percent |
|-----------|-------|---------|
| 109 | 109 | 100.00 |

| Observation | Freq. | Percent |
|-------------|-------|---------|
| Little to No Influence | 36 | 11.54 |
| Some to Great Influence | 277 | 83.86 |
| | 313 | 100.00 |

Concerns about cost were paired with questioning community-based scientific evidence: "More unbiased evidence needed." and "Would need to see the data that it's highly effective." Respondents were mostly in active clinical practice, with half seeing 50-100 patients per week, with 13% at higher volumes. The most common specialties were internal medicine (36%), family medicine (34%), and obstetrics and gynecology (16%). We received responses from 61 out of 120 Kentucky physicians, with 49% in private practice, 36% in hospital inpatient service, 10% in solo practice, and 5% in academic institutions. The greatest uncertainty (46%) was whether ADFs deterred smoking of tablets. About half of prescribers (55%) believed that all opioid formulations were abuse-deterrent. branded formulations (7%), general surgery (5%), orthopedic surgery (5%), and pain medicine (3%). MorphaBond® extended-release (7%) was the most commonly prescribed opioid formulation.
### Reasons why patients REFUSED an ADF

| Reason                                           | N     | Percent  |
|--------------------------------------------------|-------|----------|
| No influence                                     | 132   | 74.58%   |
| Little to No Influence                           | 30    | 8.02%    |
| Some to Great Influence                          | 74    | 56.49%   |
| Little Influence                                 | 6     | 4.58%    |
| No Influence                                     | 13    | 10.08%   |
| Little to No Influence: 13.08%                   | 13    | 10.08%   |
| Little to No Influence: 7.69%                    | 6     | 4.58%    |
| No influence: 6.15%                               | 8     | 6.15%    |
| Little to No Influence: 13.08%                   | 311   | 90.41%   |
| Little to No influence: 7.69%                    | 132   | 74.58%   |
| Little to No Influence: 13.08%                   | 6     | 4.58%    |
| Little to No influence: 7.69%                    | 8     | 6.15%    |
| No influence                                     | 36    | 27.91%   |
| Little to No Influence: 13.08%                   | 129   | 100.00%  |
| No influence                                     | 36    | 27.91%   |
| Little to No influence: 13.08%                   | 129   | 100.00%  |
| Little to No influence: 7.69%                    | 6     | 4.58%    |
| No influence                                     | 36    | 27.91%   |
| Little to No influence: 13.08%                   | 129   | 100.00%  |

### Observations

| Practice Setting | N     | Percent  |
|------------------|-------|----------|
| Out-of-10        | 91    | 100.00%  |

**Risk difference**: 0.0978406

**Chi-sq(1)**: 0.09

**Pr>chi2**: 0.7692

### Observations

| Practice Setting | N     | Percent  |
|------------------|-------|----------|
| In or Out        | 36    | 100.00%  |

**Risk difference**: 0.0233677

**Chi-sq(1)**: 0.25

**Pr>chi2**: 0.6148

### Observations

| Practice Setting | N     | Percent  |
|------------------|-------|----------|
| In               | 91    | 100.00%  |

**Risk difference**: -0.0254

**Chi-sq(1)**: 0.09

**Pr>chi2**: 0.7692

## Pharmacist Confidence in ADFs

| Confidence Level | N     | Percent  |
|------------------|-------|----------|
| No               | 132   | 74.58%   |
| Little           | 30    | 8.02%    |
| Some             | 74    | 56.49%   |
| Great influence  | 6     | 4.58%    |
| No influence     | 13    | 10.08%   |

**Total**: 364

**Freq.**: 374

**Percent**: 100.00

**Cum.**: 100.00

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Out-of-10 prescribers. About 59% were influenced by abuse deterrence technology being innovative.
Members of the early adopter phenotype tended to believe ADFs were very effective in reducing misuse/abuse of opioids (PRR 3.2; 95% CI 2.7, 3.7). Early adopters were disproportionately in early or late career (less than 15 or 35+ years of practice). There was no differences in state legislation or specialty type. Changing beliefs/attitudes towards Opioid risk screening in the early adopter group is associated with more Opioid prescribing overall. Early adopters were more likely to be in oncology and OB/GYN specialties.
|                | Agree | Disagree |
|----------------|-------|----------|
| Total          | 110   | 95       |
| Agree          | 32.64 | 28.19    |
| Disagree       | 72.40 | 39.76    |

Patients in my community.

Misuse/Abuse is a problem in the community:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Exposure       |               |           |       |
| Early adopter | 22.10         | 19.72     | 21.60 |
| Unexposed     |               |           |       |

Prescribing frequency:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Effective      | 90            | 23        | 113   |
| Not effective  | 16            | 5         | 21    |

Prescribing (days)

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Not effective  | 18            | 9         | 27    |
| Effective      | 5             | 11        | 16    |

Prescribing: any non-OxyContin ADF:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approval       | 0             | 1         | 1     |
| Nonapproval    | 199           | 101       | 300   |

prescribes any non-OxyContin ADF:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Cases          | 22            | 61        | 83    |
| Noncases       | 51            | 199       | 250   |

Prescribes ANY ADF:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Cases          | 16            | 37        | 53    |
| Noncases       | 37            | 114       | 151   |

Payer restriction:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 15.15         | 16.67     | 15.48 |
| Not approved   | 26.14         | 26.39     | 26.23 |

Risk difference:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 13.31         | 19.44     | 14.68 |
| Not approved   | 26.24         | 25.00     | 25.97 |

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 100.00        | 100.00    | 100.00|
| Not approved   | 100.00        | 100.00    | 100.00|

Strongly agree:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Cases          | 61            | 22        | 83    |
| Noncases       | 62            | 104       | 166   |

Somewhat agree:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Cases          | 65            | 12        | 77    |
| Noncases       | 57            | 138       | 195   |

Somewhat unsure:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 74            | 17        | 91    |
| Not approved   | 174           | 233       | 407   |

Somewhat disagree:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 5             | 0         | 5     |
| Not approved   | 16            | 1         | 17    |

Strongly unsure:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 0             | 1         | 1     |
| Not approved   | 51            | 199       | 250   |

Strongly disagree:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 0             | 1         | 1     |
| Not approved   | 5            | 21        | 26    |

Prescribes:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 0             | 1         | 1     |
| Not approved   | 0             | 1         | 1     |

Prescribes:

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approved       | 0             | 1         | 1     |
| Not approved   | 0             | 1         | 1     |

|                | Early adopter | Unexposed | Total |
|----------------|---------------|-----------|-------|
| Approval       | 0             | 1         | 1     |
| Nonapproval    | 0             | 1         | 1     |
|                              | Total | Exposed | Unexposed | Attr. frac. pop |
|------------------------------|-------|---------|-----------|----------------|
|                              |       |         |           |                |
| **Belief that**               |       |         |           |                |
| **Prob among their patients:**|       |         |           |                |
| Hospital clinic:              |       |         |           |                |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk ratio**                |       |         |           |                |
| **Point estimate**            |       |         |           |                |
| **95% Conf. Interval**        |       |         |           |                |
| **Cases**                     | 60    | 33      | 27        |                |
| **Noncases**                  | 324   | 185     | 139       |                |

|                              | Total | Exposed | Unexposed | Prev. frac. ex. |
|------------------------------|-------|---------|-----------|----------------|
|                              |       |         |           |                |
| **Risk difference**           |       |         |           |                |
| **Hospital clinic:**          |       |         |           |                |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |                |
| **Prob among their patients:**|       |         |           |                |
| Hostpital clinic:             |       |         |           |                |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Emergency physicians:         |       |         |           |            |
| **chi2(1) = 0.13**           |       |         |           | Pr>chi2 = 0.7222 |
| **Risk ratio**                |       |         |           |            |
| **Point estimate**            |       |         |           |            |
| **95% Conf. Interval**        |       |         |           |            |
| **Cases**                     | 33    | 14    | 19        |            |
| **Noncases**                  | 185   | 139   | 46        |            |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
| **Likelihood-ratio chi2(1) = 0.0746** |       |         |           | Pr>chi2 = 0.785 |

|                              | Total | Exposed | Unexposed | Risk ratio |
|------------------------------|-------|---------|-----------|------------|
|                              |       |         |           |            |
| **Risk difference**           |       |         |           |            |
| **Hospital clinic:**          |       |         |           |            |
| **chi2(1) = 0.03**           |       |         |           | Pr>chi2 = 0.8551 |
| **Risk**                      |       |         |           |            |
| **Prob among their patients:**|       |         |           |            |
| Hospital clinic:              |       |         |           |            |
| **chi2(1) = 0.0746**          |       |         |           | Pr>chi2 = 0.785 |
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